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WEST EUROPE REPORT

SCIENCE AND TECHNOLOGY

CONTENTS

AEROSPACE

BUDGET OF FRANCE'S CNES DECREASES SLIGHTLY FOR 1985

Paris ELECTRONIQUE ACTUALITES in French 19 Apr 85 p 18

[Article: "In Spite of a Slightly Reduced 1985 Space Budget, the CNES Will Allocate Larger Amounts to the Ariane Family"]

> [Text] The CNES [National Center for Space Studies] has a 1985 budget of FF 4,741 million, slightly less than last year.
>
> Current programs, marked in 1984 by milestones like Ariane 3 and Telecom 1, will be continued and 1985 will also be devoted to implementing programs and feasibility study stages decided in 1984, in particular launching means for which the French contribution to the ESA (European Space Agency) will amount to FF 871.1 million.
>
> Launchers account for 21.11 percent of the CNES 1985 budget, compared with 17.8 percent last year.

After a period of strong growth during which it rose (in current francs) from FF 3.56 billion in 1983 to FF 4,763 million in 1984, the CNES budget will be smaller this year: FF 4,741 million. Also, French participation to European programs, FF 1,749 million, will account for 36.9 percent of French space expenditures in 1985, compared with 39.9 percent last year. On the other hand, bilateral cooperation (FF 557 million) and the national program (FF 1,007 million) will increase, amounting respectively to 11.7 and 21.3 percent this year, compared with 11.3 percent and 20.7 percent in 1983.

Application Programs

Application programs represent the largest share of expenditures (46.41 percent), close to half of which will be allocated to launching means. Thus, as part of European multilateral cooperation, FF 871.1 million were earmarked for the Ariane program, i.e. 50 percent of the total French contributions to the ESA. An amount of FF 113.85 million is provided for the preliminary development stage of the HB-60 engine, so that subsystems will be defined and the technologies to be used selected in 1985 and 1986. As is known, the ob-

jective is for engine qualification to take place in 1991 and a first test flight in 1993, so that the Ariane 5 launcher will be operational by mid-1995. The budget allocates FF 475.9 million to Ariane 4, a launcher that should be available by mid-1986 and capable of putting 4.3 tons into geostationary orbit.

For its part, France will devote up to FF 121 million of its national program budget to prepare the dossier of the Ariane 5 program as well as a technological studies program specific to the launchers. As far as ground facilities to support the programs are concerned, FF 659 million were allocated for 1985. This will cover in particular technical launching and operating resources (stations, computing and testing means, Guyana space center). Note that the second Ariane launch site, ELA 2, is to be placed in service in August 1985. The budget also covers the implementation of additional resources for payload preparation.

Earth Observation

Of the budget devoted to the national program, close to FF 620 million are intended for Earth observation, in particular for the Spot program, the first satellite of which, Spot 1, will be launched next September, and the second around mid-1986. The credits allocated for this purpose this year will be used to finalize technical acceptance procedures, complete the development of operating procedures and start the operational stage. In addition, a technological program will be undertaken to increase the service life of observation satellites and improve service quality. As part of the European ERS 1 [Earth Resources Satellites] ocean observation program, a national support program will make it possible for the French industry to study technologies related to space radar. Similarly, with the participation of IFREMER (French Institute for Ocean Research and Development), the CNES will contribute to the creation of a center that will process, archive and distribute ERS-1 data, which will then be operated by the ESA.

As far as space telecommunications are concerned, since the General Directorate of Telecommunications will cover most of Telecom-1 expenditures, except for its launching, and since the Athos technological program is now being redefined, the CNES will allocate most of the corresponding budget to continue, jointly with the French industry, the study of a platform adapted to the market of the 1990's.

10.9 Percent for Sciences

The research and development effort, for which FF 163 million are provided this year as part of the pluriannual CNES program, will bear in particular on studies of missions, systems and techniques specific to the Hermes low-orbit manned spacecraft program.

In Europe, France continues the ECS [European Communications Satellites] program, the third telecommunications satellite of which is to be launched this year, as well as the Meteosat program, the first operational element of which (Meteosat P-2) will be launched by Ariane 4 in 1986. In the field of scientific satellites, two solar and plasma physics projects, Soho and Cluster, are the object of industrial studies, in preparation for the selec-

tion of the next European project, in 1985 or 1986. Simultaneously, evaluations of projects of planetary missions toward asteroids (Agora) or the Saturn system (Cassini) are being made jointly with NASA. France is also participating in the Ulysses program of ESA, which is scheduled to start in 1986. Another ESA program, Hipparcos, is now in progress. Launching is scheduled for 1988. Note that, with FF 517.8 million, sciences account for 10.9 percent of the CNES 1985 budget (compared with 8.92 percent in 1984).

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AEROSPACE

AEROSPATIALE OF FRANCE CREATES GROUP FOR STRATEGY PLANNING

Paris AFP SCIENCES in French 19 Sep 85 p 28

[Article: "Reorganization of Aerospatiale's Structures"]

[Text] Paris--Aerospatiale [National Industrial Aerospace Company, or SNIAS] announced on 12 September that it was reorganizing its departments and creating a "forecasting, planning and programming" team to assist president Henri Martre and, in particular, to define the group's strategy. "Strategic decisions," involving high industrial, social, commercial and financial stakes, have major long-term implications as they "weigh most heavily on the future and therefore require the most complete forecasting data," Mr Martre wrote in his organization guideline.

The "forecasting, planning and programming team" called "G3P" will be directly answerable to the president. It will constitute a convergence and synthesis link for all information, analyses and preparations for decisions involving the company's strategic choices, whether they bear on technologies, products, programs, industrial policies or cooperations.

The "G3P" consists of the following departments:

- Department of Plan and Budget headed by Mr Jacques Teyssier;
- Department of Programs with Mr Yves Michot;
- Department of Industrial Policy with Mr Pierre David;
- Department of Economic and Strategic Affairs with Mr Gerard Desseigne.

The company's Department of Information and Communication, headed by Mr Rene Bouronne, is now directly answerable to the president.

In addition, on 1 January 1986, Mr Jean Charles Poggi will succeed to Mr Pierre Usunier as head of the Department of Ballistic and Space Systems.

The new head of this important department was born in Toulon on 27 September 1932. A graduate from the Polytechnic School, Master of Sciences (Aeronautics) of the California Institute of Technology, former auditor at the Institute for Higher National Defense Studies, he was successively engineer in the long-term planning office of Sud-Aviation, engineer at the Ballistic Missiles Development and Manufacturing Company (SEREB), technical manager, then assistant general manager of the European Space Systems Development

and Integration Company (SETIS), program manager of the French-German economic interest group Euromissile, sales manager of the Aerospatiale Aircraft Division, and chief of staff of the chief executive officer of this company before being appointed assistant general manager in charge of plans, programs and budgets since 1982.

He is a member of the International Academy of Astronautics and associate fellow of the American Institute of Aeronautics and Astronautics (AIAA). He is chevalier of the Legion of Honor, chevalier of the National Order of Merit, and has been awarded the Medal of Aeronautics.

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AEROSPACE

FRANCE'S SAGEM BUILDS BUBBLE MEMORY FOR EURECA PLATFORM

Paris ZERO UN INFORMATIQUE HEBDO in French 23 Sep 85 p 53

[Article signed N.R.: "SAGEM Launches Its Magnetic Bubble Memories Into Space"]

> [Excerpts] From 1965 to the latest Ariane launch, last September, SAGEM [Company for General Applications of Electricity and Mechanics] has participated in 29 space programs. Today, this habitue of orbital rendezvous is launching magnetic bubble memories into space.

In collaboration with ESD (Serge Dassault Electronics) for the computer part, SAGEM has developed operational magnetic bubble memory boards for spacecraft. It is the COPRA project: self-reconfiguring parallel-architecture computer, which was developed from the concept of "fault tolerance computer."

This represents a 97-percent probability of correct operation for a 7-year mission in the case of a computer placed aboard a satellite. COPRA could also be used to pilot aircraft and ships, and to monitor nuclear power plants or offshore drilling platforms. It has a memory capacity of 128 K, expandable to 1 MB.

A Market Spread Out in Time

The software, too, is divided into tasks, and the information contained in memory is partitioned. A programming error cannot propagate itself. A state-variable mechanism also makes it possible to safeguard the objectives of a mission, causing only a slight downgrading by giving up non-vital functions of hardware resources.

The COPRA computer should be used on board for the first time with the EURECA platform [European Retrievable Carrier]. A recorder having a capacity of 256 Mbits, using 4-Mbit packages assembled on 32-Mbit boards was also developed under a CNES [National Center for Space Studies] contract. It is the EBS 2801 that should equip several satellites by 1988.

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AEROSPACE

BRIEFS

AUSTRIA'S PARTICIPATION IN HERMES--Austria intends to contribute to the financing of the French project for the construction of the Hermes European space craft, Mr Heinz Fischer, Austrian minister of scientific research, announced on Monday, after his conversations with Mr Frederic d'Allest, CNES [National Center for Space Studies] director. Mr Fischer indicated that Austria would contribute from 1 to 2 percent of the total Hermes project budget (FF 16 billion). "I am quite confident that I shall be able to find full financing for the Hermes project" (at least 50 percent of which will be financed by France), Mr d'Allest told the FRENCH PRESS AGENCY, insisting on Europe's determination to be independent as far as manned flights are concerned. Mr d'Allest also indicated that Austria would probably become a full-fledged member of the European Space Agency (ESA) early in 1986; for the time being, it is only an associate member. [Text] [Paris AFP SCIENCES in French 19 Sep 85 p 27] 9294

CSO: 3698/7

AUTOMOBILE INDUSTRY

NEWEST PIRELLI TIRES IMPROVE PERFORMANCE

Milan L'INDUSTRIA DELLA GOMMA in Italian May 85 pp 37, 56

[Text] According to the experts' forecasts, the sales of auto tires in Europe will remain stable at a total quantity of 150 million per year up to 1990. Nevertheless, a real boom is forecast for the super-lows--that is, for the tires whose tread-width to side-height ratio is equal to or less than 0.65. There will be a 50 percent increase in the mass produced auto models equipped with these types of tires at the factory, while an increase of 30 percent is foreseen in the sales of super-lows as replacements.

In Europe today Pirelli furnishes 33 percent of the super-low tires at first fitting and replacement. For all the vehicles sold in Europe which are factory fitted with super-low tires, Pirelli furnishes 76 percent of the tires in Spain, 60 percent in Italy, 46 percent in Sweden, 44 percent in Great Britain, 38 percent in France, and 23 percent in the FRG.

One of the reasons for Pirelli achieving these high levels of sales is its long experience in this field since 1974, year in which the super-low P7 was introduced.

Together with the P6 this innovative tire gave what was then considered very high performance for a normal radial tire, with an optimum equilibrium between road-gripping capability, comfort, and quietness.

The "Performance" European Market

The past years have also strongly influenced auto makers which have increasingly leaned toward equipping their cars with this type of tire. As a consequence, even the replacement market has undergone profound changes.

For this particular segment of the market Pirelli foresees additional significant increases in the coming years. For first fittings, estimated this year at 5.3 million "performance" tires in Western Europe (not a high number in absolute terms as the entire market for first fittings is estimated at 55 million units for 1985, nevertheless indicative of high dynamism if compared with 0.3 million in 1976), a growth up to 10 million is foreseen for 1990.

As far as replacements, the increase predicted for the high performance tires during the coming years appears even greater. Always according to estimates

made known by engineer Carlo Banchieri, Director of Product Operations of Pirelli Tires Coordination, the "performance" share of the auto tire replacement market in Western Europe--after having gone from 500,000 units in 1976 to 4.8 million this year--will reach 10.5 million units in 1990, thanks to an average annual growth rate of about 16 percent.

Two Innovative Tires

Such is the perspective in which Pirelli is making the decision to further consolidate its position in this sector by preparing a new generation of super-low radials destined for both class H and class V, that is to say for speeds up to and beyond 210 km/h.

Called P600 and P700, the tires presented in April to the world press are characterized by various progressive features:

--Application of the most advanced scientific methods for designing the tires, with extensive use of computer-performed calculations, design, and testing;

--Introduction of new methods of production, with the simultaneous utilization of materials specifically developed for this purpose;

--Utilization of information gathered from the wide experience acquired during 11 years of Pirelli presence in the sector of super-lows, by joint participation with auto makers in the development of tires for high performance vehicles, and by collaborating with the most important rally, speed, endurance, and formula one teams.

The new Pirelli P700 is destined to replace the legendary P7, while the P600--characterized by very high performance when compared with other super-lows of the H class--will be sold concurrently with the P6, which today is mounted as first tires on over 70 models of cars built in Europe, Japan, and the United States, and will remain, therefore, a major product for Pirelli for many more years.

The P700 and the P600 encountered immediate success among auto makers even before their introduction in the commercial market; for example, Porsche has chosen the P700 for all its models starting the fall of 1985 (1986 production), while Saab has already approved the P600 for mounting on the "9000 Turbo 16".

The P700 Frame

Among the new technical solutions adopted in the P700 tire so as to obtain the requisite high performance, is the frame which requires the use of two rayon fabrics placed one upon the other at a very small angle, interleaved with a cushion made of a special rubber mixture. Then, to insure maximum tire adhesion to the flange of the rim, the P700 has an appropriate protuberance in the lower part of its sides which completely seals the tire once the correct inflating pressure is achieved.

To increase the cutting-edge lateral rigidity, the radial has two high-modulus nylon plies placed at zero degrees above the two metallic cord plies. The resulting dimensional stability of the tire is such that in laboratory tests performed at the maximum limits of speed (322 Km/h), only a 1.5 percent variation was observed.

Finally, the P700 tread pattern takes advantage of a directional placement of the tread elements, pointed out by large arrows on the sides which indicate the correct mounting on the rim.

When compared to the previous P7, the improvements introduced in this tire translate in gains of 50 percent longer wear for sport car driving, of 20 percent in controllability, road-gripping capability and resistance to aquaplaning effects in turns, and of at least 10 percent in most other driving tests.

Single Fabric Structure for the P600

To satisfy user requirements which are seemingly conflicting with each other, the designers have instead opted for a single fabric structure for the new Pirelli P600. This solution has brought about a noticeable improvement in road-gripping capability on dry and wet pavements, surpassing the already high qualities of the P6.

Also present in the P600 are two metallic cord layers on top of which are two high-modulus nylon plies placed at zero degrees. The resulting effect assures exceptional dimensional stability even at high speeds: the P600 (approved in the HR category to a rated maximum of 210 km/h) has withstood laboratory tests at 250 km/h, a speed which represents truly a record for a tire of this category.

The tread pattern--with a percentage of voids equal to 37 percent--is of the diagonal type, which produces a turbojet effect for the purpose of draining water. Additionally, the tread orientation was designed for ideal behavior in turns and on the straightway (even when driven to its rated maximum speed) and for low noise levels. Compared to the P6 the tread of the new Pirelli super-low is, in fact, quieter (10 percent lower noise level), with a decrease of 3 dB.

The P600 tread mixture is the same as the more sophisticated P700. Thanks to the multi-polymer formulation, it has optimum characteristics on dry and on wet pavement, withstanding even the highest temperatures.

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BIOTECHNOLOGY

ELF RESEARCH CENTER IN LABEGE, FRANCE, STRESSES PRODUCTS

Paris BIOFUTUR in French Jun 85 pp 57, 63, 65

[Text] The Research and Development Center in Labege belongs to the firm Elf-Bio Recherches, a subsidiary of the Elf-Sanofi Group. Its scientific director is P. H. Schmelck.

1. Integration of Industrial Constraints in the Definition of Projects

The research done there is research of an industrial nature. Its primary objective is to obtain a product (clone, method, molecule) and not merely a research result. Industrial constraints are also taken into account from the very outset of the defining of a project: Upper limit of a production cost, quality of the product, conformance to regulatory controls...

These constraints are adhered to throughout the development of the process extending from the research laboratory to production on a pilot, semi-industrial scale.

A relatively long time is devoted to the research stages preceding the development of processes on a pre-industrial scale.

The subjects of research are selected as a function of their industrial interest. Still, close to 29 percent of the projects are specifically related to the resolution of biological problems encountered during the development of processes: Cellular physiology, growth, metabolism, genetic expression, transduction, translation, secretion...

The results of completed research are developed along three main lines: Pharmacy, food production, and oil chemistry.

2. Development of Multidisciplinary Techniques From Research Stage to Pilot Stage

All the infrastructure needed for these stages is present in the Center. Its architecture and organization are configured also as a function of other criteria: Exchanges among the disciplines at all stages of the developmental

developmental work. In biotechnologies, it is indeed indispensable that disciplines as diverse as molecular biology and fermentation processes work in close-knit relations with each other. This is a concept of developmental work that originated in France.

The activities of the Center are multidisciplinary. They are divided up among nine units:

--Organic chemistry (DNA synthesis);

--Molecular biology of the gene;

--Technology of recombined microorganisms

Expression and physiology;

--Technology of recombined animal cells

--Biochemistry of proteins;

--Analytic chemistry;

--Industrial microbiology;

--Phyto-technologies (in vitro methods and cultures of vegetal cells);

--Pilot: Fermentation and extraction; purification.

Added to these units are service units: Scientific computation, data processing, and documentation.

Access to Every Unit

The units were opened up one after the other. The first to have become operational at Toulouse were those concerned with genetic engineering strictly speaking. A quick walk-through of the various laboratories suffices to observe that the researchers, who are numerous in relation to the other units, have at their disposal the most sophisticated of apparatuses: An oligonucleotide synthesizer, designed to determine the best sequences to be used for genetic constructions; a protein microsequencer, indispensable for verifying the primary structure hence the quality of the proteins obtained. A characteristic of these units is the importance given to the study of the physiology of production systems, that is, the relation between the composition of culture media and certain parameters that are essential to production (growth, expression, secretion...). At the research level, small fermenters (2 liters-20 liters) are used to carry out this work and to provide to the pilot laboratory the culture conditions best suited to bring processes to the semi-industrial stage.

The purpose of the industrial microbiology unit is to provide either new molecules (enzymes, antibiotics...) or new properties by sieving microorganisms from specimens obtained from various natural habitats. A sizable

portion of the unit's present resources is devoted to "oil programs" (enhanced recovery of hydrocarbons and biocorrosion). The unit also takes part in research on and improvement of the production of new antimicrobial agents. And, in collaboration with the Elf Group's Environmental Department, the unit provides support in the area of biological treatment of industrial effluents.

The plant technology unit, only very recently installed, is equipped with sophisticated culture chambers and small plant laboratories designed to maintain constant the environment of cultures (luminosity, hygrometry, temperature). They contain plantlets growing in sterile conditions, cultures of cells being grown in the form of calluses (undifferentiated vegetal tissues proliferating on a solid medium or in suspension in an agitated liquid medium). These cellular cloned colonies, after optimization of their characteristics and of their biosynthetic capacity, can be used for the production on an industrial scale of various active compounds for the pharmaceutical sector (morphinic derivatives, for example), flavors, perfumes, and any other interesting substance of vegetal origin. Using undifferentiated cells, it is also possible to regenerate new plants and to select those that exhibit interesting properties from the standpoint of responding to requirements for improving species of agronomical interest. In collaboration with Rustica, work is presently under way on the sunflower, barley and rape; the plants of these species are being juggled around in the first operational greenhouse (100 square meters of area), pending the imminent construction of several hundred square meters of new greenhouses.

All of these units operate in close relationship to the developmental pilot. Being of sizable volume, the pilot operates in environmental conditions approaching those of an industrial production unit. Its role is to develop processes to full scale and to optimize them. It fine-tunes the fermentations of microorganisms, of animal cells (and soon, vegetal cells), as well as large-scale extraction and purification systems. In the domain of fermentation of microorganisms, the pilot unit already has 17 fermenters, one of which has a capacity of 450 liters and is currently being used for the production of growth hormone by means of E. coli.

From the Standpoint of Work Flow

A visit to Labege leaves no doubt that the problem of conviviality and of exchanges at all levels has been carefully worked out. Materially, everything possible has been done to facilitate exchanges (proximity of laboratories, cafeteria, etc). It is also reasonable to expect that, induced to collaborate, researchers and technicians of widely different disciplines and training will interact more on the basis of regard for their respective competencies than on that of a hierarchy of their field of knowledge. This has been concretized by the successful transfer of the protocol of production (biosynthesis and purification) of the human growth hormone from the laboratory to the pilot level.

[End of main body of text; boxed inserts follow]:

[Boxed insert p 63]: The Labege Center

Construction work having commenced in 1982, the Center, representing an initial investment of 100 million francs, opened its doors in April 1984 and was officially inaugurated on 10 January 1985.

As of the end of 1984, its floor space totaled some 7,200 m^2, of which 2,600 m^2 were allocated to research, 600 m^2 to the pilot unit, 100 m^2 to completed greenhouses, and 3,600 m^2 to general services (technical floors). Two special floors were provided to enable access to the Center's infrastructure facilities without disturbing the work going on in the laboratories. Expansion of the laboratories and of the pilot unit is under way, and the foregoing areas may even be tripled. The Center's staffing will total 150 persons by the end of 1985, more than 120 of whom will be in research and development.

The building structure is presently in the form of a transfer RNA. The building is in fact in an intermediate stage, since planning calls for expansions of its research space. What cellular type does the definitive structure hold for us?...

[Boxed insert, lower left of p 65]: Principal Programs

Pharmacy Sector

--Human growth hormone presently in the industrial production stage;

--Human Interleukine 2;

--Vaccine against hepatitis B;

--GRF (Growth Hormone Realizing Factor) or somatocrinine.

By yearend 1985, this sector will employ more than 50 persons in research and the pilot unit.

Food Production Sector

--Food additives and biopolymers;

--Growth factors;

--Improvement of seeds (rape, corn, sunflower).

Projects in this sector will employ some 15 persons as of yearend 1985.

Oil Chemistry Sector

--Enhanced recovery of oil;

--Bacterial corrosion;

--Biological characterization of oil deposits and sediments.

This sector will employ some 15 persons.

Added to these projects is high-end production and technological research representing more than 20 persons.

[Boxed insert, lower right p 65]: Collaboration With Other Centers

With respect to research, the Labege Center works closely with the other research centers of the Group:

--In the pharmaceutical domain (the Montpellier, Toulouse, Milan and Brussels centers), since the products obtained from biotechnologies must still be further developed to produce medicinals from them (pharmacological, toxicological, Galenical and clinical studies) before they can be put on the market;

--In the oil domain (the Pau, Lacq, and Solaize (Lyon) centers), particularly as regards high-performance analytical chemistry techniques (spectrometry, NMR [nuclear magnetic resonance]) and enzymatic engineering.

Relations with the industrial development structures are also very close:

--Pharmaceutical production (Sanofi Chimie);

--Veterinary domain (Sanofi Sante Animale);

--Food production (Ceca, Rousselot, Entremont, and the flavorings entities Dairy Land Food Laboratory and Rustica);

--Oil (exploration, production, refining);

as they also are with the logistical services: Market studies, patents, data banks.

The Labege Center is thus wide open to the different entities of the Group. The same is true outside the Group, its research activities being complementary and/or contributory to basic research at the high end. Thus, its joint research efforts in France are numerous: With INSERM [National Institute of Health and Medical Research], CNRS [National Center for Scientific Research], College of France, Pasteur Institute, INRA [Agronomical Research Institute], and the universities. And abroad, with the Wolfson Institute, the Salk Institute, and American, European and Japanese universities.

Relations with other industrialists have also been developed:

--Domestic "nitrogen fixation" contract involving three institutes and three industrialists;

--Contract with Roussel Uclaf for the development of Interleukine 2.

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CIVIL AVIATION

FRG'S DORNIER DEVELOPS HIGH-RESOLUTION DISPLAY SYSTEM

Friedrichshafen DORNIER POST in German No 4, 1984 pp 21-23

[Article by Hans-Peter Engelhardt: "GEOGRID--Geographic Information Display System with High-Resolution Color Display"]

> [Text] Geographic representations, especially maps, increasingly have to be annotated with rapidly changing supplementary information, e.g. military positions. For this purpose, Dornier has developed the GEOGRID system, the main components of which are mass memory (laser disks), a high-resolution display controller (HADIC) and a high-resolution color raster display.

Conventional Geographic Information Representation

Up to now, working with maps has been associated essentially with the medium of paper. For various users, there are maps containing the most varied information which are generally made by overprints specific to the application on an existing base map.

To represent rapidly changing supplementary information on maps, which arises, for example, in depicting military positions, there are quite different techniques in use today:
--drawing or plotting on paper maps or on overlays
--representation on transparent plasma displays by rear projection of the appropriate map from a slide, film or microfiche
--representation on projection areas whereby the position is projected by a laser projector and the map by a map projector, one on top of the other.

These methods require expensive equipment, represent the map and the overlay by different methods and are not suitable for further processing by computer and communication of the combined map/overlay information to other workplaces.

New Digital Presentation Method Suitable for Computers

The GEOGRID geographic information display system, which enables interactive work with maps on a high-resolution color display, is being developed to solve these problems by using computers.

The GEOGRID system contains digitized maps on mass storage (laser disks) which can be loaded as required into the display memory and mixed there with supplementary information produced by computer or interactively. By connecting additional monitors, the information can be depicted locally at several workplaces or sent by fast data communication lines to remote places for further processing when required.

For this, disregarding the hardware and software required, in the first step, the existing map material has to be digitized into suitable form. Investigations already made with various digitizing methods have shown that digitizing based on the plates used in printing the map produces the best results qualitatively.

At least 4, and at most 12, plates are used to print a map. Each plate corresponds to a particular color.

The individual manufacturing steps in digitizing a 1:50,000 map can serve as an example. The 1:50,000 map has four different colors:
--green for forests
--blue for water
--brown for contour lines and marking of main highways
--black for all other information such as road and path networks, built-up areas, vegetation, legends, geographic coordinates, etc.

These four color plates are scanned line by line on a high-resolution raster digitizing device with a resolution of 100 micrometers. In the process, 1,000 x 1,000 bits of information per plate are produced per 10 x 10 cm map area. For a 1:50,000 map with dimensions of 60 x 60 cm, this amounts to a data base of 18 megabytes.

A suitable method is then used on a computer to copy these digitized printing plates one on top of the other; for each individual raster point, a selective decision is made on which color is to be represented; the priority series is black --> blue --> brown --> green. The color separations made this way are reassembled into a complete map on the GEOGRID system.

System Structure

The GEOGRID system has these components:
--HADIC high-resolution display controller
--digital laser disks as mass storage
--high-resolution color raster monitor
--operator controls such as an alphanumeric keyboard, track ball and graphics tablet
--optional color hardcopy
--interface to host computer/communication system

The system is controlled by the HADIC [high-resolution display controller] which contains the required software in a computer based on the Intel 8086 16-bit microprocessor and a high-resolution display controller.

The digitized map material and the required supplementary information such as, for example, a digital elevation model are stored on the digital laser disk and can be loaded through a fast data channel into the high-resolution display controller. The maps and supplementary information are displayed on a high-resolution color monitor with 1024 x 1024 color points resolution.

An alphanumeric keyboard is used for text and numeric input into the system. A track ball is used for symbol and cursor positioning. A graphics tablet can be used for freehand input.

Supplementary information generated interactively on the GEOGRID can be sent through a suitable interface to a higher level computer or communication system.

High-resolution Display Controller System

The GEOGRID system control unit is the high-resolution display controller. This high-resolution display controller system, developed at Dornier, is used to display color graphics and color image information such as maps.

The high-resolution display controller displays images with a resolution of 1024 x 1024 image points and a maximum of 256 different colors from a palette of 2^{24} or 16,777,216 color possibilities per image displayed. The individual color printing inks are coded and placed in image dot storage; each color code can be assigned through a table to any color. For the five colors (four basic colors plus background) of a 1:50,000 map, three of the maximum of eight planes of image dot storage needed. Therefore, the other five planes are available for supplementary information.

Image dot storage can be expanded to 2048 x 2048 picture elements; this allows operating in a fourfold map area with a display section of 1024 x 1024 pixels without having to reload image dot storage.

Digitized maps are reloaded from the digital laser disk directly through a fast channel into image dot storage within seconds.

All high-resolution display controller electronics are housed in a 19-inch slide-in module.

Mass Digital Storage

A digital laser disk is used as mass storage for the digitized maps and perhaps supplementary information.

The laser disk is a storage medium which was developed from video and CD [compact disk] disk technology; it can hold up to 1 gigabyte (up to 2 gigabytes on a double-sided disk) of information. In the process, the user can store information directly on the laser disk and recall it as often as needed. The high reliability and durability of the storage medium make it ideally suited for long-term storage of large amounts of data.

GEOGRID System Applications

The GEOGRID system can be used anywhere where conventional maps, not digitized, have been used until now in planning, command and control, and evaluation, such as, for example, in
--command and control systems
--mission planning systems
--intelligence evaluation systems.

The first steps toward introducing the GEOGRID in these areas can be taken today already by using existing display hardware in such systems. Once the complete map is digitized, systems prepared this way can be retrofitted for the digital map without any problems.

8545
CSO: 3698/653

COMPUTERS

ERICSSON COMPUTERS RECORDS LOSSES, U.S. MARKET FAILURE

Stockholm SVENSKA DAGBLADET in Swedish 3 Aug 85 p 1

[Article by Nina Sallnas]

[Text] Ericsson's semiannual results will suffer from losses on the order of several hundred million kronor in the Information Systems area, SVENSKA DAGBLADET learned. The production of personal computers has been halted temporarily. So far this year Ericsson has sold only half as many computers in the United States as previously estimated.

Ericsson's marketing of the Swedish-produced personal computer ETC has met with serious difficulties. During the first 6 months of this year, Ericsson sold about 500 computers per month, according to Hakan Ledin, executive vice-president of the half-owned Ericsson Inc in the United States. The goal was to sell about 1,000 computers each month.

"We are now concentrating our efforts in areas where we have done well, primarily in the northeastern United States," Hakan Ledin said.

Ericsson's introduction of its personal computer in the United States came at an unfortunate time. There has been an overall reduction of about 20 percent in the computer market in the United States.

"And, of course, it is more difficult for a new company such as ours than for the established companies," Hakan Ledin said.

The other products from Ericsson's Information Systems--bank terminals and the new MD 110 private exchange--are doing well, however, according to Hakan Ledin.

United States Analysis

About 1 month ago, an American banking firm analyzed Ericsson. The firm was skeptical of Ericsson's chances in the United States.

Production of the personal computers in Brakne-Hoby, where about 250 people work, was halted just before vacation time. On 22 August, when Ericsson also will present its report for the first 6 months of 1985, the decision will be

made as to how many personal computers will be manufactured during the rest of the year.

Ericsson already has had to revise its production goal for personal computers several times. Late last year when Stig Larsson became the new executive vice-president of Ericsson Information Systems, EIS, he initiated an extensive program for reducing costs.

In late 1984 the 1985 production goal was set at 50 to 100 thousand computers. Before the vacation, about 25,000 computers had been produced.

'No Shutdown'

Nils-Ingvar Lundin, temporary head of public relations at EIS, denied all rumors of a shutdown in production.

"The market is definitely not dead and as long as there is a market we will remain in it," he said.

Stig Larsson is reported to be "locked in his room and pouring over the figures." He will have no comment to the mass media before the semiannual report is made public on 22 August.

In 1984 the Information Systems branch of Ericsson showed a loss of 217 million kronor. The reasons given were a component shortage, production disruptions, too-rapid expansion, and internal organizational problems.

At the stockholders meeting in mid-April, Ericsson chief Bjorn Svedberg indicated that EIS would have difficulties during the first half of 1985. Well-informed sources outside Ericsson have told SVENSKA DAGBLADET that the losses for this period will be between 200 and 600 million kronor.

Marketing

While sales in the United States have been far below the predicted level, the domestic market has been 7 percent higher than predicted so far this year, according to Nils-Ingvar Lundin, who said that sales elsewhere in Europe also had gone well.

Ericsson will kick off an intensive marketing campaign in Sweden for both the EPC personal computer and the new portable personal computer manufactured in Japan.

"This is an indication that we are remaining in the market," Nils-Ingvar Lundin said.

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CSO: 3698/650

COMPUTERS

CRAY-2 SUPERCOMPUTER FOR STUTTGART UNIVERSITY

Frankfurt/Main FRANKFURTER ALLGEMEINE ZEITUNG in German 21 Aug 85 p 25

[Text] In the coming year, the University of Stuttgart will receive a Cray-2 computer. This is the most powerful system that is available on the market at the present time. Depending on the task at hand, the computer can perform up to 2 billion calculations per second. The system is approximately 14 times faster than the Cray-1 computer at the Stuttgart Data Processing Center, and with some 2 billion bytes, its memory is 250 times as large. The computer, which has four separate processors, operates with a cycle time of only 4.1 billionths of a second. The Stuttgart Data Processing Center is also utilized by institutes associated with other institutions of higher learning in Baden-Wuerttemberg, as well as by industry. The state government regards the purchase of the supercomputer as "another important contribution to the development of Baden-Wuerttemberg as one of the leading research areas in Europe.

At the present time, there are 107 Cray computer systems installed in various parts of the world, six of which are located in Germany. The most serious competition for this computer comes from Control Data Corporation's Cyber 205. There are 35 systems of this type currently in use throughout the world, four of which are located in the Federal Republic of Germany.

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JPRS-WST-85-030
28 October 1985

FINNISH COMPUTER, MICROCHIP R & D SURVEY

Helsinki HELSINGIN SANOMAT in Finnish 18 Jun 85 p 23

[Article by Heikki Arola: "It's Video Disc Time at the Lohja Company"; passages in slantlines printed in italics]

[Text] Absolute absence of dust is the most important video disc production factor.

The Lohja Company intends to succeed in the production of its flat display terminal where Valco failed: in bringing into the country a new industrial product of the high tech age, one which demands of its manufacturer extreme accuracy, precision and a production plant from which even dust particles have been eliminated.

In the final analysis other reasons were decisive in the collapse of Valco, but this was one of them: The rapidly assembled personnel did not conform to the extremely clean conditions that must be borne in mind in the semiconductor industry. The percentage of production rejects remained too high for too long.

A modern, high tech plant is more reminiscent of a school for midwives or an operating room than a factory. The workers wear full-length white smocks, face masks and rubber gloves on their hands. The difference from the operating room is that in a new tech plant they do not worry about bacteria's spreading. Powder and dust motes, particles that may be only a thousandth of a millimeter in size, give rise to dread. Just one mote in the wrong place can render the product useless.

Since Valco there has not been a high tech industry comparable to the semiconductors in Finland, but now there is, now that Lohja has begun production of its electroluminescent video disc.

New Culture

The chief developer of the video disc, Dr Tuomo Suntola, spoke of the new industrial culture. In his opinion, moving from a cellulose plant to a semiconductor plant is as big a jump as moving from the field to a cellulose plant was before.

A building has been erected in Olari newr Espoo in which they are beginning production and will reach full capacity within 2 years, at which time the plant should be turning out 10,000 video discs a month.

With its pillars and extension wings, the building in Olari is peculiar-looking, but the odd appearance is not due to any attempt to make it look peculiar or at architectural flamboyance. There is a clearcut objective in its form, which is determined by the production process.

The plan emanated in its purest form from the center of the building, where the so-called clean area is located. There a thin layer of film is produced on a sheet of glass by means of Lojha's own process and with its own equipment. The end result of the process is a flat video disc which Lojha sells as components to the world's big computer and instrument manufacturers.

A section was built into the lower part of the clean area from which materials used in the process, like gases, are conveyed to the upper floor through the floor. In the upper part of the clean area there are extremely powerful air conditioners which replace production plant air through filters about 20 times an hour.

They built up offices and accommodations for workers around the clean area and in this way Finland's first plant originally designed as a high tech plant was completed.

Out with the Particles

In display terminal production, as in the semiconductor industry in general, the first key word is /particles/, which means dust or powder motes.

From 1 to 10 million particles per cubic foot float about in the ordinary air circulating in a room.

In a semiconductor plant they try to get rid of them entirely at the most important production points, where they do not fully succeed in doing so even with the best equipment. Particles are still found, but their number is reduced to from 10,000 to 1,000 per cubic foot.

Lohja's most difficult production problem is posed by the /hard particles/, glass or metal dust which the workers call stone or gravel. There is no need to be concerned about the soft particles that are detached from clothing and people's skin, for example, in all stages of production because they disappear through burning in the course of the process.

Up with the Yield

The second key work in video disc production is /yield/. It simply means the degree of success, how many units that have gone through the process that are fit for use.

The rate of yield is essential in all industrial production operations, but in the semiconductor industry it is of greater importance than, for example, in the manufacture of milk bottles.

In semiconductor production the yield may be very small; for example, the yield percentage at microchip plants may fluctuate between 20 and 70 percent.

In general the rate of yield is one of a semiconductor firm's most carefully kept secrets. The yield can be raised by spending money on refining the production process, but that does not pay endlessly either, so a compromise figure must be sought somewhere.

Suntola did not say either what the Lojha Company's video disc production yield is at the present time. It is, however, considered to be sufficiently high since it would not otherwise pay to go into production.

Suntola did, nevertheless, have the courage to say something: "Our rate of yield is even surprisingly good. Better than we could have expected."

Increasing the yield can be influenced in many ways. According to Suntola, it is even influenced at the general level of the plant through attitudes. This is why more than usual was invested in the Olari building. The same phenomenon has been observed in conventional machine shops too: The cleaner the surroundings, the better the effect on the work.

Slight Advantage

The third key word in Lohja's video disc production is /packing property/. Suntola claimed that this is a property by means of which Lojha's product will gain a slight, but decisive advantage over its competitors when during the next few years they really begin to divide up the video disc market.

Packability is the fact that the production process developed by the Lojha Company is not at all as sensitive to critical particles, that is, dust motes, as its competitors' processes are.

In other words, a few stray dust particles in the interstices between the thin films of Lojha's video discs do not ruin the whole product: The process has the ability to "pack" particles so that they are harmless. This property is a consequence of the atomic layer technique developed by Lohja.

According to Suntola, this packability improves the yield of the Lojha process and the better the yield, the lower the production costs and the bigger the profit derived from the product.

Lohja is therefore also prepared, if necessary, to engage in a price war and, according to Suntola, price is the factor that determines the consumer's choice in these products, not, for example, a slightly better picture quality than the competitor's product.

The price of Lojha's video disc is now five times as much as that of a picture tube. Suntola wagers that at the latest by the next decade the price level of the flat video disc will drop by at least twice as much as that of the tube. At that time the demand will grow at an explosive rate, then video discs will sell and Lojha intends to be one of the hardest sellers.

Price Down

What are Lojha's real chances of attaining a "sales volume of several hundred million" in a few years time with its video disc, as is in keeping with the company's objective?

"It's a question of price and everything depends on the success of the mass production process. If they begin to produce a good product, it's possible that the price will rapidly sink since the raw materials don't cost much," a semiconductor expert said.

"We have our foot in the door now," Tuomo Suntola said, "but that doesn't mean that the challenges will become fewer in the future."

Competitors have to be watched closely, but because of his very own production process Suntola does not much fear that Lojha's end product might be copied. Other video disc techniques and entirely new production technologies by means of which production costs could be sharply cut or the product substantially improved pose a greater danger.

At any rate, Suntola expects there to be more flat video disc manufacturers within the next 5 years. Many big firms are displaying interest in it.

The competition is also forcing Lojha to continue with its product development. Suntola intimated that the electroluminescent video disc will not be the only application of the thin film process developed by the company. In principle it could also be used in the production of exacting liquid crystal displays.

Suntola said that it did not, however, pay to talk about their own production of liquid crystal displays, although the company has an empty site for additional construction opposite the Olari plant. A more likely alternative would be to collaborate with, for example, Japanese manufacturers by selling them the thin film technique, but so far the matter has not even been discussed.

Advantages of Electronics

Having spent 20 years in concentrated research on electroluninescence, Suntola might easily be taken for a typical theorist. Without wanting to be identified with any camp, he could not fail to praise the advantages of the electronics industry for a remote country like Finland with a high level of education: "The price per kilogram of passenger cars and meat is roughly the same, somewhere between 50 and 100 markkas. The price per kilogram of semiconductor electronic products can be 100 times that or more. These are truly international products; shipping costs are of no significance."

Superchips Are Coming

A plant for the manufacture of microcircuits is to go into operation in Finland next year. It is anticipated that the plant, which belongs to the Micronas Company, a joint venture of Nokia, Outokumpu and Aspo, will meet about a third of the country's microchip needs.

The world's largest semiconductor manufacturers in Japan, the United States and Europe are simultaneously competing in a race in which they are striving to produce /superchips/, chips containing greater information capacity than before. With them in turn they would be capable of manufacturing thinner, smaller and possibly cheaper electronic devices than are at present in use.

In the manufacture of superchips they are dealing with really small units of measurement. The goal is to go beyond the magical limit of the micron, a thousandth of a millimeter.

We get some idea of the size of a micron when we compare it with the thickness of a hair. A hair is about 100 microns thick.

The first microchips, in which conductors containing transistors only a micron thick are side by side, are expected to be marketed as early as next year. At that time they will have gotten a million transistors, four times more than in the best chips currently in use, to fit into one microchip.

And the next step is to get to a half-micron conductor, which would mean 4-million-transistor microchips. It is estimated that it will be in production by the end of the decade. They calculate that it will take until the middle of the next decade to develop a quarter-micron microchip, but they consider it to be fully possible. One chip would contain tens of millions of transistors.

Lower Limit

For years engineers felt that the practical lower limit of semiconductor to be built for a silicon disc was a micron, but the more experience they have had, the lower the limit has shifted.

The shifting of the semiconductor industry to ever smaller dimensions means that plants will gradually have to be wholly automated. Just a person's presence alone may interfere with the production process at the plant where they must attain completely dust-free conditions.

Thus they are switching to plants in which microchips handle the production of microchips.

It is estimated that some 30 of the biggest semiconductor manufacturers in Japan, the United States and Europe are in the superchip race. The Japanese are generally considered to have a tiny lead with Hitachi, Fujitsu and NEC in the lead. Those U.S. firms farthest in front are Texas Instruments, Motorola and IMB. The U.S. Department of Defense is a strong supporter since they could

not build star wars equipment without the superchips which create new dimensions.

The Europeans too are seriously participating. The continent's electronics giants, Siemens and Philips, have together launched the several billion markka "Megaproject," which the West German and Dutch governments are financially supporting. They have agreed to limit cooperation to research only. The firms will handle production independently, if they ever get that far.

In Crisis

The experts indeed regard the Siemens-Philips project as a hopeless attempt to at least somewhat continue to participate in a development that has managed to to a great extent slip out of European hands.

Semiconductor circuit production is at present in an international crisis. The industry is splitting into two parts. Only about 10 of the largest of the world's approximately 200 semiconductor manufacturers are capable of building giant plants in which the production of standard chips can be profitable. The others will have to specialize in small volumes and special products.

Ordinary mass-produced chips have become a commodity for speculation and shortages and overproduction of the product fluctuate alternately in the market.

It does not pay for Micronas either, which in international terms will become a very small producer, to start producing standard chips; rather it is concentrating on chips tailored to a specific purpose for the customer. Finnish manufacturers of electronic products will still procure standard chips from abroad.

Even after the Micronas chip plant is built, one important phase in the production of integrated circuits, encapsulation, will continue to be handled in the Far East. Micronas will only have a small experimental encapsulation line with which it will encapsulate perhaps 100,000 chips a year, whereas its total production amounts to tens of millions of units.

In Sweden the organization of its own encapsulation is regarded as a national issue for military reasons. Ericsson's subsidiary, RIFA [expansion unknown], is getting a subsidy from the government to build its new plant. When it is completed, it will be capable of encapsulating a million chips a year, which is really only 3 percent of Ericsson's needs alone.

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CSO: 3698/574

FACTORY AUTOMATION

FMS ACTIVITY EXPECTED TO INCREASE IN EUROPE

Milan AUTOMAZIONE INTEGRATA in Italian Jun 85 pp 59, 112

[Text] Activity in flexible manufacturing technology and systems (FMT-FMS) has increased noticeably in Europe in the last 3 years and a continued increase is foreseen in the immediate future especially in the FRG, France, Italy, and the United Kingdom. According to a new study done by Frost & Sullivan, the annual demand for all types of flexible manufacturing technology including complete systems of 3 or more machines and duplex cells, will expand by 1990 from the 120 million dollars of 1984 to over a billion dollars. "Flexible Manufacturing Systems in Europe" (No E684) asserts that there is an important change taking place in European manufacturing systems which is witnessing the transfer from dedicated machines, line transfer and batch production, to groups of flexible, automated machines. The reason is that companies want to benefit from the FMS capability to reduce costs and increase competitiveness through lower inventories, lower personnel needs, and quick response to new market demands through shorter time for launching new products.

An FMS is made up of computer-controlled machines, automatic devices for manipulation and transport (for example, robots), and the appropriate storage for the pieces and pallets to be mounted on the machines. An FMS can range from autonomous cells to large systems with a dozen or more machines, automatic inspection systems, and a computerized control mechanism connected to the integrated sequence operations control system.

In theory FMS technology can be applied to any industry that manufactures products containing mechanical parts, although at present the automotive industry is the only sizeable sector making use of it.

Globally, this industrial sector has about 43 percent of the total installed FMS, however their value approaches 50 percent of the total. According to the aforementioned report, at second place for FMS applications is the electronic industry.

West Germany boasts the strongest mechanical industry in Europe (it is, for example, double that of England) which is associated to the larger machine industry. It is natural, therefore, for it to be the leader in Europe in the application of FMT. Presently, there are 35 FMS installed in Germany and the report states that the average annual investment is between 15 and 20 million dollars. Although it has a smaller market and a weaker industry, the United

Kingdom is not far behind; in fact, it presently boasts 33 installed systems, with an average annual investment between 14 and 16 million dollars.

Until now, over 60 percent of the investments in Western Europe have been made by large companies with over 1000 employees, while less than 10 percent of the investments have been made by small companies with less than 500 employees. The report by Frost & Sullivan forecasts that by 1990 the small companies' share will increase noticeably to 15 percent of the market, while the large companies will lose ground, settling at 47 percent. Although the report covers all the countries of Western Europe, it concentrates on four key markets: Germany, France, Italy, and the United Kingdom, where up to now the major share of investments in FMT has taken place.

The 285 page report (plus 4 appendices) shows a detailed picture of the FMS market, with an analysis by type of installation, country, industrial sector, and FMS component (work center, robots, control systems, etc.).

The report, costing $1900, is available from Frost & Sullivan Ltd, Customer Service, 104-112 Marylebone Lane, London WIM 5FU, England.

13120
CSO: 3698/658

FACTORY AUTOMATION

ITALIAN ROBOTS AUTOMATE FIAT, ALFA ROMEO ASSEMBLY LINES

Milan MACCHINE in Italian Jun 85 pp 63-65

[Text] An innovative installation, product of a collaboration between Alfa Romeo and Fiat (from these assembly lines emerge the mainframes of the Alfa 90, the Thema, and the new Tipo 4), has been built with the participation of various Italian companies which operate in the area of industrial automation (Comau, Bisiach e Carru, Asea), while the fitting out of the new lines has been entirely carried out by Alfa Romeo. The robots, with their automatic movements, perform unaided the soldering and the assembly of the suspension arms, of the frame and the posterior cross-bar on which are attached the tie rods supporting the motor of the vehicle. Economic justification for the new robot-manned assembly lines is assured by the greater volume of production the two most important auto makers of the nation can together guarantee and by a considerable increase in quality standards.

Additionally, in case new products are to be assembled, 60 percent of the installation can be reconverted and reprogrammed for the new requirements, something that was not at all possible with the old "fixed" production installations.

On the line where the suspension arms are assembled there are 13 robots: 9 Smart of the Comeau for doing spot welding on sheet metal, 3 of Asea for electric welding in a controlled atmosphere, and 1 robot for unloading the pieces from storage racks moved by automatically controlled shuttles. Four workers per shift are assigned to the operations of loading the lines only; everything elese is done by the robots. Previously, this phase of the work employed 21 workers per shift. Each Smart robot manipulates two pliers for spot welding, with considerable savings in investments; additionally, its welding program can be changed according to requirements and the dimensions of the pieces to be worked.

The spot welds performed are 196 while there are about 20 40mm stitches done by a continuous-weld process in CO_2. Even in the recent past, welding in a controlled atmosphere was done completely manually, and the unusually harmful conditions forced the workers to take frequent breaks. Today the transfer of these tasks to robots has overcome uneconomic and harmful conditions. Additionally, the substitution of the old relay bins with the new programmable controllers hs allowed substantial savings of space (five times less space) for

the installation--demonstrating that the new technologies modify even the physical characteristics of large manufacturing plants. In case of a breakdown, the system is now able to quickly pinpoint the problem spot, while previously a search was necessary to determine its cause.

If robot or pliers malfunction, the assembly line stops automatically, thus preventing the omission of any spot welds. Also, malfunctions data kept in memory permit the compilation of statistics useful for preventive maintenance. The construction of the cross-bar for the rear suspension takes place instead, in two "islands" where are located two tables which rotate to four positions. One single worker is assigned to loading the tables with the components while the two robots of the island perform the welding and one other takes care of the unloading. In the first island there is one Asea robot for the CO_2 welding and one Bisiach e Carru for spot welding. Two other islands in the section assemble the components of the frame with two Asea and two Comau Smart robots working there. Another operation takes care of the assembly of the suspension arms which are built of high resistance sheet metal components. The geometry of the piece is achieved on a turntable using resistance seam welding pliers and CO_2 stitching. The welded piece is then taken away by an aerial arm and transported to various stations where robots automatically complete the assembly.

13120
CSO: 3698/658

MICROELECTRONICS

THOMSON, CNET OF FRANCE IN SILICON-ON-INSULATOR RESEARCH

Paris ELECTRONIQUE ACTUALITES in French 8 Mar 85 pp 1,18

[Article by J.P. Della Mussia: "To Replace the SOS Technology, CNET-Thomson Agreement on SOI Circuits"]

[Excerpts] Grenoble--A cooperation agreement involving research on a silicon-on-insulator (abbreviated as SOI) technology designed to make circuits with a low sensitivity to radiations was just signed by the Norbert-Segard Center of the CNET [National Center for Telecommunications Studies] in Grenoble and Thomson Semiconductors. This technology should eventually replace the SOS (silicon-on-sapphire) technology still used by Thomson Semiconductors to make military and space circuits, but whose progress is hampered by problems of cost and defects in the epitaxial layer.

The results already obtained by the CNET with this SOI technology make it possible to hope that insulated circuits with practically no substrate-related defects could be obtained on 4-inch wafers within the next 18 months.

If all goes as expected, an industrial machine capable of producing 4-inch SOI wafers should then be available within 30 months, thus providing Thomson Semiconductors (Military and Space Circuits Division) with a 2-3 micron SOI process line.

As with the SOS technology, the active silicon layer can thus be very thin (0.5 micron in practice) and can make it possible to obtain insulated islands; thus, as fas as electric performance is concerned, SOI technology offers the same advantages as SOS technology. In addition, the substrate is inexpensive and manufactured industrially.

The whole problem, therefore, lies with the possibility of giving a single-crystal structure to silicon deposited on silica, although is has to have a polycrystalline or amorphous structure since it is deposited on a surface that does not have a single-crystal structure.

It is precisely over this problem that researchers are stumbling, or at least were stumbling, for defect-free single-crystal zones of increasing size are now obtained in the laboratory.

Two methods are used in France to achieve this conversion to a single-crystal structure; both consist in creating a zone on the verge of melting in an area that is devoid of silica, then in moving this zone slowly on top of the silica so that, during cooling, conversion to a single-crystal structure is induced on the original silicon and follows the movement of the melted zone on the silicon to be treated. This localized melting can be obtained with a laser: the LETI [Electronics and Data-Processing Technology Laboratory] and the CNET are studying this method more particularly to obtain three-dimensional integrated circuits for the ESPRIT program [European Strategic Program for R&D in Information Technology] (Thomson is project leader for the community); it can also be achieved with a heating lamp: the CNET expects much from this process, the main goal in this case being to create substrates that could replace SOS rather than creating three-dimensional circuits. For the time being, it is the latter method that is yielding the best results as fas as conversion of large surfaces to a single-crystal structure is concerned. Is it this method that is now covered by an agreement with Thomson Semiconductors.

A 3-Year Agreement

Until now, the CNET and Thomson had carried out separately their research on SOI technologies. Now, based on the encouraging results obtained by the CNET, they will start a 3-year collaboration that should turn these research results into a 2 to 3-micron SOI process validated by a circuit that could be a static RAM memory.

Collaboration will thus involve three domains:

- expertise with an SOI material offering the qualities of massive silicon;
- development of machines to achieve recrystallization of a silicon layer;
- development of the industrial process.

Stages have already been scheduled:

- production, within 6 months, of treated 4-inch wafers capable of supporting good circuits over more than 50 percent of their surface;
- if this goal is reached (the CNET has already almost reached it), a rate of 100 percent will have to be achieved within 1 year;
- simultaneously, within 12 months, a model of recrystallization machine should be completed; the first industrial machine would have to be completed within 30 months.

"Thermal Profile" Problems

A priori, it is hardly conceivable to achieve homogeneous recrystallization at 1410°C on a whole wafer, while also getting rid of the impurities deposited on silica simultaneously with silicon.

The Norbert Segard Center thus uses a trick that was disclosed a few months ago: it consists in causing small caret-shaped melted areas to move simultaneously along parallel bands 20 micron wide and 4 microns apart. The operation starts at the edge of the wafer, on an area where the silicon to be processed is in contact with single-crystal silicon (there is no oxide

there); the melted areas are moved parallel to one another, and the impurities tend to move away on each side of the caret point as the latter advances. Eventually, conversion to a single-crystal structure starts at the point of the area and extends to its edges, and the impurities concentrate in the 4-micron wide areas between the bands.

As can be guessed, the whole knowhow resides in the way the thermal profile of the melted area is modulated. Localized heating variations can be obtained either by varying the incident power or by varying the surface reflection.

Tubular lamps scan the surface at a rate of about 1 mm/s; in practice, it takes only 5 to 10 minutes after preheating to process a wafer. The wafers obtained have a single-crystal structure only on the parallel bands; the designs of the chips to be integrated will therefore have to take this lack of homogeneousness into account and to reserve the waste-collection areas for interconnections.

9294
CSO: 3698/5

EXCIMER LASER PRODUCES .2 MICRON SEMICONDUCTOR STRUCTURES

Solothurn CHEMISCHE RUNDSCHAU in German 31 May 85 p 5

[Article: "Fine Structures with UV [Ultraviolet] for New 4M-bit Memory]

[Text] Semiconductor structures 0.2 micrometers in size have been manufactured for the first time by using the light of an excimer laser in the contact printing method. To increase the storage capacity of a chip, micro structures must become more and more fine and with that their manufacturing methods become more and more expensive. Optical methods for producing such highly resolved structures have the advantage that the light can be basically focused on a point which is about the size of the wavelength used. Therefore, it goes without saying that an ultraviolet [UV] light source is better suited than an infrared.

Excimer lasers from Lambda Physics, Goettingen, which emit between 193 nm and 351 nm, because of very short wavelengths and high UV output are predestined for making highly resolved structures by using photolithography.

Micro structures 0.2 micrometers in size can be produced by using the light of an excimer laser. This is the first time that structures of this size have been implemented by an optical method. Compared to electron beam lithography, this method has the advantage that no basically new techniques are required and the exposure can be performed under normal conditions, i.e. high vacuum is no longer necessary.

Structural fineness of 0.7 micrometer in size needed to manufacture 4M-bit memories and hyperfrequency GaAs semiconductors can be implemented with the UV light from this laser.

8545
CSO: 3698/652

PHILIPS DEVELOPS MBE PROCESS FOR LASER, CHIP MANUFACTURE

Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 6 Aug 85 p 5

[Article: "Philips Develops New Method for Manufacturing High-Precision Lasers and Chips Using Molecular Beam Epitaxy for Fast Electron Clouds]

[Text] Frankfurt. Philips Research Laboratory in Redhill (Great Britain) announced that by using molecular beam epitaxy, which was developed in-house, it has succeeded in manufacturing a special laser from gallium arsenide and aluminum gallium arsenide which operates at very short wavelengths of 707 nanometers. This has made it possible for the institute to achieve high electron mobility in a two-dimensional electron gas. Philips says these results of molecular beam epitaxy are of great importance to both the science of semiconductors and practical applications. Precisely in the semiconductor industry, it is extremely important to control dimensions, makeup and purity of the materials used to achieve the required electrical properties. For various reasons, gallium arsenide as a material for semiconductors imposes higher demands on processing methods than, for example, silicon. Gallium arsenide has essentially a "jagged" surface and doping with impurity atoms requires higher temperatures at which these impurity atoms tend to fly out again from the gallium arsenide.

Epitaxial methods, however, allow more precise operations in which the crystal layer intended for the electronic circuit is not subsequently bombarded with impurity atoms, but in which the operative crystal layer is built up to the desired structure slowly on a substrate. Philips reports that vapor and liquid phase epitaxial methods are routine today. But what is new is molecular beam epitaxy with which layers can be grown by positioning of atoms. Using this method, molecular beams of the compound elements gallium, arsenic, aluminum, phosphorus and indium (depending on the application) strike a heated substrate (gallium arsenide, for example) and are adsorbed there in layers. The growth rate and structure of the layer depend on the beam intensities. In the process, the molecular beams can also be switched on and off by using screens.

Philips reports the system can be fully automated whereby the makeup of complex multilayer structures can be programmed. The growth rates lie in the range of one atomic layer per second which results in total growth rates of a couple hours for the desired layer structures. The screen opening times are about 0.1 second and thus allow abrupt changes in the layer makeup and very precise control of layer thicknesses. In this way, structures of many thin films with very sharp junctions can be produced. The entire process runs in an ultrahigh vacuum system.

Philips also reports that measuring techniques suitable for this method are also being developed. An interesting method is reflected high energy electron diffraction (RHEED) which can also be used during crystal growth. With it, an electron beam with an energy of 10 to 50 kiloelectron volts is directed under banded incidence to the crystal surface. A diffraction pattern is then produced on a fluorescent screen opposite the electron beam system. Since the molecular beams strike the substrate almost vertically, both systems do not disturb each other. Information on the material surface can be acquired from the diffraction pattern and brought into relation with the surface structure of the film being grown. RHEED can also be used to count the individual separating atomic layers which allows very precise control of the thickness.

An application of molecular beam epitaxy worth noting is the manufacture of gallium arsenide semiconductor lasers which emit in the visible light spectrum, while gallium arsenide lasers otherwise normally radiate infrared light. This effect is encountered, according to Philips, when the active film of the laser is less than 50 nanometers or about 200 atomic layers thick. Then quantum effects and energy level differences are encountered which are atypical for the compact material ("potential wells"); they force light emission at shorter wave lengths than would be the case with thicker material.

A major reason for the interest in gallium arsenide circuits is that electrons move faster in this material than in silicon compounds. Gallium arsenide circuits therefore switch faster and raise computer performance considerably. With that, the chip technique, however, has not yet reached its performance limit. Philips reports that the speed of the electrons can be increased even further. Recently, a structure of an aluminum gallium arsenide film on a highly pure gallium arsenide was developed. At the boundary surface between these materials, a two-dimensional electron cloud forms in the gallium arsenide with considerably higher electron motion. According to Philips, this can produce transistor structures which are suitable for operation at very high frequencies of about 100 gigahertz. Molecular beam epitaxy also offers here the prerequisites for extremely precise operations which are indispensable for these developments.

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MICROELECTRONICS

THOMSON SEMICONDUCTORS INTRODUCES PRODUCTS, BALANCES BOOKS

Paris MINIS ET MICROS in French 23 Sep 85 p 25

[Article by Roger Carrasco: "Thomson Semiconductors: Microsystems Operations Must Become Profitable"]

[Text] It has been decided: Thomson Semiconductors' microsystems operations (devoted to the production of boards and development machines) must break even this year and turn a profit by next year. To this end, a whole series of new products were announced at the beginning of summer.

Headed by Guy Lauvergeon, microsystems operations, a part of Thomson Semiconductors' MOS [metal-oxide semiconductors] division, are in a turmoil. Witness the fact that, within one year, over 30 or so new products were developed, in particular in the field of the VME [Versa Module Eurocard] bus, and they point out that this is indeed internal development, not licensing agreements.

Obviously, the state of mind has changed in this Thomson subdivision: they want to acquire technical expertise in products so as to serve their clients best; they want to manufacture products and sell them; they want to build up a complete line; in brief, they want to become a leader as far as their operations are concerned.

Yet these are not new in the company. Indeed, already in 1980, a development system called Themis had been launched. Soon afterward, a whole series of boards built around the G64 bus developed by Gespac were announced. In 1982, the VME bus was adopted, with Motorola, Philips and Mostek. In between, Eurisys had been created: another development system running under the OS9 operating system, and the line of boards in the simple Europe size with a G64 bus was expanded. Since then, these operations have been continued; a first VME CPU-board was announced in 1983; a VME development system was introduced in 1984; etc.

What is new is that, in the past few months, microsystems operations have been established as a profit center within the MOS division, which places actual "responsibilities" on the whole technical and commercial staff, and this

probably accounts for the new state of mind we just mentioned. It also accounts for the avalanche of new products that were developed, most of which are now being marketed.

The VME Line

It now consists of about 20 boards, plus software and systems. We shall dwell in greater detail on their characteristics in the column "New Products." Very briefly, the line consists of four basic CPU boards (with variations as far as microprocessor speed is concerned) using 68000 or 68010 microprocessors. These are boards that often have a very high circuit density, with many possibilities.

For instance, board TSVME 102, which is the basic board of a Unix machine, includes a memory-management unit (68451), 64 K of RAM, 128 K of ROM, a SASI [Shugart Associates System Interface] interface with direct memory access, a Centronics interface, a real-time clock and its monitor, etc. It sells for FF 17,000.

Four boards with diverse memories are also available, in particular a multifunction board including input/output circuits, 450-ns RAMs (up to 1 MB) with parity detection, ROM supports, a timer, a programmable switch, etc. It is referenced TSVME 201 and sells for FF 12,000 to 15,000, depending on the memory capacity.

The line also includes various controllers for communication, for the control of an IEEE [Institute of Electrical and Electronics Engineers] 488 bus, and for graphics (board TSVME 600 based on a 68483 processor, with memory map on the board and VDI [virtual-device interface] graphics primitives memorized in a PROM). Finally, it is completed with a few input/output boards and analog-to-digital and digital-to-analog converter boards.

This whole line of boards is obviously aimed at industrial markets in the broader sense, and in particular process-control equipment (which represents 32 percent of the market), scientific computing laboratories (24 percent), communications (12 percent), data acquisition (9 percent), etc.

To cover this whole range of applications, various software and systems are offered: X25 network communication software (including some to cover level 3); the OS9/68000 operating system with Pascal and C compilers in particular; and finally Unix systems consisting of the above-mentioned VME boards associated to mass memories (floppy or hard disk units and tape units if need be).

The G64 Line

Commitment to VME does not mean that development of the G64 line does not continue. Quite to the contrary, this line should indirectly benefit from the efforts undertaken to fill out the other. For instance, all functions developed in VME technology will be reproduced in G64+. But priority is given to the former, which is considered to hold greater promises for the future.

In 1990, the 16/32 bit market should represent, by value, a total of $2.1 billion for 8-bit products (according to Dataquest). Based on these data, Thomson Semiconductors estimates that, by then, the VME market will represent $525 million, compared with $798 million for the Multibus I and II, $630 million for the Q-Bus, and $147 million for other bus types, which will experience a relative decline starting next year.

The G64 line nevertheless benefited from several novelties, both in the field of boards (central processing units based on the 6809 or 68008 processors, communications boards with two serial channels) and in the field of systems running under OS9/68000.

Distribution and Ambitions

The marketing strategy implemented simultaneously with the introduction of the products aims at getting 10 percent of the VME market around 1988, i.e. 2.5 to 3 percent of the world 16/32 bit market.

The first efforts will naturally start in France, especially through distributors which, until now, accounted for about 70 percent of sales. This figure could change in the future if technical support from distributors should prove inadequate, since the microsystems subdivision will develop its direct sales force.

At present, the network of distributors consists of 10 companies or so, of various sizes, covering the whole national territory. They include Tekelec Airtronic, Composants SA, Gedix, Pep, Sodimep, Dimel, etc.

But management's ambition will not be satisfied with staying within French borders. Their goal is naturally Europe and, above all, the United States where they already have an observer who is studying how they could establish themselves there next year.

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MICROELECTRONICS

FINLAND'S NOKIA BUYS U.S. FIRM'S EUROPEAN SUBSIDIARIES

Helsinki HELSINGIN SANOMAT in Finnish 20 Jun 85 p 26

[Text] The big American computer firm Mohawk Data Sciences' (MDS) six European subsidiaries are being transferred to Nokia ownership. The MDS subsidiaries' sales volume this year is estimated at $58 million, or 365 million markkas. A total of 700 people are employed by the subsidiaries.

Nokia electronics director Timo H.A. Koski said that, when the deal is concluded, it will be of particular importance for Nokia, which will through it obtain sales channels for its own data systems to Western Europe, particularly West Germany and France. Even after the sale, the subsidiearies will continue to sell MDS terminal systems in the countries in question. In addition to the above-mentioned, subsidiaries operating in the Netherlands, Belgium, Sweden and Denmark will be transferred to Nokia.

The sale will be officially confirmed by 13 July. Actually, Nokia has sent its bid for the subsidiaries that are for sale. At this point Nokia has no serious competitors.

According to director Koski, the "waiting period" means that Nokia is reviewing the condition of the companies.

Like many other American firms, MDS has decided to divide up its activities.

The West German subsidiary is the biggest and it employs 300 people. Nokia will be getting ready-made organizations for its data system in Central Europe and a unit that will consolidate its service activities in Sweden.

Nokia has bought Europe's leading manufacturer of auto radiophone filters, a majority share of the Lauri Kuokkanen Company. The firm operates in Kempele and employs 140 people. Half of the production goes into exports and the customers are radiophone factories in Europe and the Nordic countries.

The company has grown substantially over the past few years and they have begun to expand the operations plant this summer.

The founder of the firm, Lauri Kuokkanen, will stay on as chairman of the board and technical director. Tapio Takalo will continue to be general manager.

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MONTEDISON RETURNS TO PROFITABILITY

Winning Its Race For Profits

Milan COMMUNICAZIONE MONTEDISON in Italian May 85 pp 4, 5

[Text] The promise is now being fulfilled: after 8 critical years, the Montedison Group is recovering its lost profitability. The 31 December 1984 balance, recently endorsed by the Administrative Council, was the first in some years to show a net gain of 5 billion lire. Modest as this boom may be, yet compared with the corporation's 1983 fiscal year, which recorded a loss of 315 billion lire, it marks a notable advance in the industry's financial situation.

The facts speak for themselves. Even though shareholders withdrew 88 billion from its global assets and the combined balance sheet registered a loss of 83 billion, nevertheless the improvement over 1983, when there was a deficit of 322 billion, is still considerable. From an analysis of the data, which shows at a glance how Montedison consistently pursued its progressive change of direction, two basic factors clearly emerge: had Italy, as other countries have done for some time, recognized a legal definition of industrial groups, Montedison's burden of federal taxation would have been less than the 62 billion it paid the government in 1984, and the combined balance sheet would have ended in the black, in view of the improvements introduced throughout the corporation and the direct results of its growing strength. Already it appears better equipped in the light of possible negative periods in the market and is predicting a return to profitability at the end of this year, whether for the group in general or for the holding corporation itself.

What brought about the turnaround

Current optimism is motivated primarily by widespread reforms introduced into the corporation's industrial management, which led to an increase in the gross operational profit of 59.9 percent, i.e., an upswing to 1.304 billion lire, representing 10.5 percent of the turnover (8:5 percent in the previous year). This rise is attributable for the most part to the advances achieved in Montedison's principal sectors: primary chemistry, in which the ratio between gross profits and proceeds rose from 5.5 percent to 9.5 percent; and secondary chemistry, which scored a rise from 11.9 percent to 15.6 percent.

For the first time in many years, Montedison's revenues made possible an operational margin sufficient to cover all its financial burdens. Although the interest allowed to be paid (bat an average rate below 16 percent) increased from 715 billion lire to 741 billion, its ratio to the turnover declined from 6.7 percent to 5.9 percent; meanwhile, Montedison has announced its intention of lowering the interest rate still further to 5 percent for the year.

The method Montedison followed to realize these goals is indeed artful. For one thing, the industry's expansion inevitably required higher expenditures, as occurred in 1984 when the company's debts totalled 4.344 billion lire--up from 4.111 billion in 1983--after disbursing 491 billion for investments as well as 250 billion for research and increased output. Other factors include Montedison's efforts to upgrade every sector of the complex, to consolidate progressively its debt structure (which accounted for 24 percent of the total, as against 37 percent in the previous year), and to exploit available materials with greater efficiency.

These forward strides toward recovery were marked by a lower ratio between floating capital and turnover (equal to 13 percent in 1982, 8 percent today) and a curb on costs, down from 92 percent of the turnover to 89.5 percent. Simultaneously with these favorable developments, the group's activities sustained a notable growth.

1984 Sales to China Doubled

Milan COMMUNICAZIONE MONTEDISON in Italian May 85 p 7

[Text] In 1984, the Montedison Group's sales to the People's Republic of China more than doubled over the previous year, amounting to 284 billion lire against 137 billion in 1983, for an increase of 107 percent. The group exported goods valued at 200 billion, including fibers, fertilizers, plastic materials (polypropylene, TDI and polystyrene), organic materials, basic chemical products (caustic soda, etc.), scientific equipment, medicinals and elements for the production of dyestuffs from Italy. These sales in 1984 accounted for 35.7 percent of all Italian exports to China, compared with 33 percent in 1983. Moreover, units of the group in Belgium, Brazil, the United States (where polypropylene is produced) and Spain (fibers) exported additional wares to China for a value of 84 billion lire.

The close rapports established by Montedison with corresponding Chinese enterprises contributed substantially to its expanded sales volume. The corporation, in fact, opened a trade office in Beijing in 1981 and a second in Hong Kong two years later, to handle business with clients in southern China.

Numerous high-level trade delegations visited Montedison and its affiliates last year, when the China National Chemical Construction corporation concluded a contract with the Acna Organic Chemical organization to import Italian technological supplies and the principal elements for a plant to produce Shreiner finishings for dyestuffs. This plant will be added to the CNCCC's chemical complex at Ilan (Jilin) in northeastern China.

Chinese authorities are manifesting considerable interest in Montedison's advance technological products, such as flouride estomers and the newest types of synthetic rubber, which will soon be added to the list of items the group is now exporting to China. Furthermore, Montedison's office in Beijing is making what appears to be promising contacts with local manufacturers responsible for acquiring foreign plants and chemical technologies. Montedison has already furnished the People's Republic of China with industrial units for the production of ammonia and synthetic gas.

The collaboration between the group and their Chinese counterparts began in the early 1950s when Montedison officials made their first contact with the Chinese Embassy in Bern, Switzerland. In 1960, a Sino-Italian agreement was reached allowing Montedison to station a permanent representative in Beijing.

In April, 1975, the group obtained permission to mount China's first exhibit of foreign goods produced by private enterprise rather than governments. Held in Tietsin, east of the capital, the exhibit displayed Italian-made electronics and scientific instruments.

In Beijing 2 years later, Montedison convoked a conference on anti-tumor chemotherapy, at which Chinese and Italian scientists together studied the properties of Adriamicina, an anti-cancer antibiotic produced by Carlo Erba Farmitalia. In May, 1980, similar conferences, although of greater significance, took place in Beijing, Shanghai and Canton,

In March, 1979, the first exhibit devoted exclusively to plastic materials took place in the city of Wuhan, more than one thousand kilometers south of Beijing as the crow flies. Again sponsored by Montedison, the event scored a notable success.

TABLE

Revenues From Sales and Investments
Employees Sector by Sector

Sector	Sales Earnings in 1984 Billions of Lire	Percentage Over 1983	Investments 1984 Billions of Lire	Employees on 31/12/84 Total	Employees on 31/12/84 Temporarily Laid Off
Petroleum and plastics	4.681	+ 16.5	67	14.649	2.701
Fertilizers	772	+ 31.0	25	3.668	237
Fibers	902	+ 15.3	41	5.205	240
Functional chemicals and plant protection	793	+ 19.3	27	4.712	647
High performance specialties and materials	447	+ 23.8	41	3.104	8
Health care	1.161	+ 13.5	68	10.269	32
Energy	190	- 9.4	129	1.065	--
Consumer and manufactured commodities	872	+ 13.4	37	5.791	98
Tertiary services	2.277	+ 14.7	35	19.157	1.354
Various activities and services	286	+ 10.7	21	3.595	218
TOTAL	12.382	+ 16.2	491	71.215	5.535

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SCIENTIFIC AND INDUSTRIAL POLICY

EUREKA OFFICIAL ON HOPES, AIMS FOR PROGRAM

Paris LE MONDE DIPLOMATIQUE in French Aug 85 p 17

[Article: "Towards a New Scientific and Industrial Cooperation" by Yves Stourdze, director general of CESTA [Center for Studies of Advanced Systems and Technologies], which compiled the document "Eureka, the Technological Renaissance of Europe" that serves as the basis of the work being undertaken under the Eureka project; and secretary general of the TCE [Technology, Growth, Employment] Working Group]

[Text] No one believed the TCE Working Group, created at the Versailles summit in 1982 at the instigation of Mr Francois Mitterrand, would survive. His initiative, however, unquestionably prefigured the new modes of technological cooperation, of which Eureka is today the most fully developed one, and the 18 programs that have issued from it that many beacons for the next 30 years ahead.

The TCE Working Group was given the task of studying the possible use of the new technologies as an instrument for the revitalizing of growth and employment. From its very first meeting at the Quai d'Orsay in August 1982, it was undeniably the battleground for unyielding clashes of ideologies--or methodologies--clashes that were inevitable, what with big nations arguing as to forms of desirable economic development and comparing the different modes of stimulation each of them deemed necessary for rapid progress to be made in the new technologies. But in counterbalance, the possibility--indeed the necessity--of defining concrete projects, of establishing tangible forms of cooperation, had already made itself felt.

Nevertheless, all the delegations strove resolutely to control their expenditures. Deep down within each, the sentiment prevailed that--with a few notable exceptions, namely, Ariane, Airbus and CERN(1)--the classic forms of technological cooperation had more often than not ended up as failures. Failures that had proven all the more disastrous for having, in general, perpetuated themselves in the form of top-heavy, inefficient and costly bureaucratic structures.

Thus, the rolling out of concrete and detailed work programs took on as much urgency as the drawing up of wording setting forth the general principles of an international accord. In December 1982, the TCE Group agreed to the

18 programs covering the following objectives: Training and studies; standards; redefinition of scientific policies; undertaking of new lines of research and new lines of development.

Moreover, the agreed domains (energies, food resources, improvement of quality of life and employment, protection of the environment, basic research) are to provide the stepping stones of growth over the three coming decades.

A Flexible Combination

The rapid progress of the TCE Group would not have been possible without having acknowledged two things as facts, namely: That there are no magical formulas for overcoming a crisis; and that the magnitude of the difficulties involved could lead to none other than a pragmatic approach. Hence, the emergence of an essential notion: A variable geometry that operates, within the TCE Group, as a guarantee of effectiveness. It enables each country to dimension its interest in each project. Thus, participation in each TCE program can be apportioned in accordance with the extent of the interest manifested by each country, and not on the basis of a formal equality.

The TCE Group reinvented, so to speak, the formula of "precompetitive joint programs," a methodology that is fundamental today to putting advanced technologies to practical use.

Competition /and [in italics]/ cooperation in the high technologies: That is clearly the issue, as much on the domestic-market as on the planetary scale. It is also the crucial factor for the future of Europe.

Contrasting with the collapse of firms like Trilogy, Gavilan, Atari, and Osborn in the United States, and with the difficulties being experienced by Acorn in Great Britain, is the prosperity--recovered or enhanced--of firms like General Motors, General Electric, Fiat, AT&T, and IBM, which are beginning to dominate the sectors of microinformatics, robotics and communications networks, etc.

In short, in all the big industrialized nations--in the United States, in Japan and in Europe--a mixed architecture is setting in. It associates lightweight, active, innovative organizations--an indispensable force during the conception and start-up phase of new technologies--with heavyweight structures, which are the only ones capable of funding, over a long period of time, a costly and arduous process of development, dissemination and commercialization. This flexible combination, which is manifest from London to Washington, from Tokyo to Paris, from Bonn to Brussels, works in conjunction with a craving for subsidization--in direct and oblique forms--and for governmental support by way of immediate pump-priming programs or lateral fiscal incentives; incentives in the form of legal provisions or defense program tie-ins; etc.

Such is the case, for example, in Great Britain, with its voluntarist action by the state to promote new information technologies through the Alvey[2]

program; and in the FRG [Federal Republic of Germany], with its program of support by the BMFT [Research and Technology Ministry] for the introduction of microinformatics into traditional industries. This triangular cooperation--innovative PME [Small- and Medium-Sized Business]-big enterprises-government--is at work on the American continent, in Japan and in Great Britain. It is explained by the need to combine efforts and talents in order to master the new technologies. Why? Because these high technologies are being born of cross-fertilizations and grafts: Telecommunications and informatics; biology, agriculture, health, and energy; mechanics, electronics and informatics.

By forming a working group on normalization of new materials, the TCE Working Group has positioned itself at a strategic round point, owing to the role that new materials will naturally be called upon to fill in all future industrial activities, and owing to the position of privileged intermediary that normalization is called upon to take between fundamental research and industrial developmental work. Friction, wear, surface treatments, ceramics, cryogenic materials(3): These are the domains being looked into by the group's experts.

A common approach to norms: This is also a concern of the food technology, biotechnologies, aquiculture, robotics and photovoltaics groups. In a world in which deregulation is the order of the day, the technical norm becomes an instrument of control... or of conquest. It loses its character as an abstract ideal and becomes a strategic instrument. IBM with the PC [Personal Computer], the Japanese with the MSX standard, AT&T with UNIX, the European information processing with OSI(4), have all clearly understood this. The contours of the high-technology markets of tomorrow will be of a geography determined as much by customs tariffs, subsidization policies, and financial strategies as by the explicit--or implicit--play of norms and standards. An international accord such as is taking shape within the TCE on standards enables the participants to better understand the stakes, to delimit their interests with the least delay, and to negotiate the taking into account of their interests in sufficient time.

Working conditions and quality of life, human ethics, the environment, high technologies: These do not develop in an abstract universe of cabalistic signs and esoteric formulas. The acid rains, the carbonic gas in the atmosphere call us to task with regard to the balances that are essential to life itself. And working and living conditions, subjected as they are to ordeal by unemployment, are in the process of complete metamorphosis: Do robots loom on the horizon as allies or as enemies? Biology, for its part, investigates our species in its every aspect, even in its most intimate retrenchments: The conditions of our reproduction. And the tragic destiny that is Africa's, confronted as it is by drought and famine, reminds us of our limitations and brings out the powerlessness of certain of our efforts.

The loss of relevance of energy as an issue, the recall to question of the logic of large-scale equipment and facilities, the emphasis on

multidisciplinary technologies: These comprise more than a mere earth tremor; they have swelled to a full-fledged earthquake that is demolishing the structures of research and development.

Suddenly, all the cards are revealing themselves stacked. Are we not witnessing what amounts to an attack in reverse by the United States against its allies and their industrialists? On the one hand, it reiterates publicly and very assertively its support of free trade and its desire to extend the regulations of the GATT [General Agreement on Tariffs and Trade] to high-technology and services transactions. But on the other hand, it shows the utmost inflexibility as regards controls on the export of "sensitive" products, such, that is, as may pose a threat to its national security. This exaggerated sensitivity, however, seems limitless: It is capable of affecting practically the entire spectrum of technologies, so completely are the high technologies now marked by a revolution that is diffusing the sophistication of the military technologies to the "civil" technologies. The "Yalta" that had been established between "top-of-the-line" technology and "light" technology has ended. The bulwark that had been erected between "heavy" equipment and "consumer-goods" technologies has collapsed. The boundary between the two worlds has been torn down. And in these circumstances, all scientific information, all civil development, can be considered "defense confidential." The desire to liberalize exchanges is coupled with the intent to screen them. And the selfsame Government that posits itself as liberal by day can exhibit a Draconian authoritarianism at night. Trade and security appear in this case to be mutually opposing principles, and the rules of the game appear fluid and even contradictory.

Triple Challenge

Understandably, then, caught between the horns of this dilemma in which any and all civil technology can be shown to be strategic, the President of the United States has been compelled to shift the boundary between these two technological "spheres" to a position out of reach at the edge of our universe, so as to definitively cut through the dividing terrain between the civil and the military, and then, with his SDI [Strategic Defense Initiative], to pave the way for "Star Wars." The countries of the East, and Japan and Europe thus find themselves facing a new front which is in the process of taking shape--that of the high technologies.

At this point, many cards are being redealt. And, duly considering the issues on which France has taken the lead in the TCE Group--particularly, its leadership of the groups on advanced robotics, biotechnologies, new training technologies, advanced technologies, and the traditional industrial structure--it appears that France, which for the past year has also been urging an intensification of the space effort, has given substance to orientations that can comprise the core of an active response to "Star Wars."

Indeed, three deregulating, or destabilizing, maneuvers comprise the backdrop and the moving forces behind the actions undertaken by the TCE Group:

--Destabilization of communications, begun in the United States, then in Great Britain and in Japan, and prefiguring the destabilization of the service industries;

--Destabilization of the energy sphere;

--Strategic destabilization, undertaken by President Reagan's SDI of 20 March 1983.

To meet this 3-pronged challenge, a redeployment becomes indispensable, because national resources are limited. A united Europe, of itself, compels recognition. From Copenhagen to Rome, from Paris to Athens, from Dublin to Brussels, from The Hague to Luxembourg, what a vast capacity! What an arsenal of capabilities! What an array of exceptional potentialities! Provided these talents close in the locks and close ranks among themselves instead of spreading out and annihilating each other! Strangely, however, the Europe of advanced technologies progresses not while retracting but rather when it opens up with intelligence. At the slightest sign of a withdrawal within itself, the centrifugal forces present inside it, and desiring to counteract this effort to unite, either establish or strengthen outside ties. Europe as an entity, therefore, can neither be conceived nor be brought into being other than by way of vitalizing confrontation and intelligent cooperation with the rest of the planet. It must, as a full-grown adult, exercise international relations in such a way as to strengthen its solidly-based power and enhance its role as partner, then as arbiter.

FOOTNOTES

1. CERN: European Nuclear Research Center.

2. British programs in information technologies and artificial intelligence.

3. Materials that retain the cold or resist it.

4. IBM, having opted for the MS-DOS operating system, has imposed it as a de facto standard for the microprocessing of information.

   All the Japanese builders use the same operating system--the MSX--for personal microcomputers. Philips has joined them.

   UNIX is the operating system conceived by Bell Laboratories (AT&T). UNIX is very highly regarded but has not yet imposed itself, largely owing to its many versions.

   OSI is a network architecture norm that enables the interconnection of heretofore incompatible computers, and particularly computers of different makes. It has been adopted by 12 European builders and recently by Digital Equipment, the American No. 2 computer manufacturer.

The OSI norm, drawn up under the aegis of the ISO [International Standards Organization], is not yet completely defined.

IBM, MSX and UNIX are de facto standards, while OSI is a norm.

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SCIENTIFIC AND INDUSTRIAL POLICY

EUROPE'S STRENGTHS, WEAKNESSES IN EUREKA TECHNOLOGIES

Paris LE MONDE DIPLOMATIQUE in French Aug 85 pp 18-19

[Article by Andre-Yves Portnoff, Claude Vincent and Claude Gele, respectively, chief editor, editor and assistant chief editor of SCIENCES ET TECHNIQUES]

[Text] Will the current proposals under Eureka facilitate the "technological renaissance of Europe," to use the phrase comprising the subtitle of the document submitted by France at the Milan summit on 28-29 June of this year? For obvious reasons of efficacy, the fashioning of those proposals was necessarily neither very detailed nor very exhaustive, since each partner had not yet been able to make known its centers of self-interest, and no convergence of views had as yet been worked out. Actually, Eureka will have to remain, for some time to come, a "Spanish open house" before it can bring forth the technological Europe it envisions.

As presented at the beginning of summer, the French ideas appeared heavily influenced by the impact of President Reagan's SDI [Strategic Defense Initiative] and by the listless reactions of many industrialists--particularly German and British--to certain of the EEC's initiatives, such as the ESPRIT information processing and electronics program. Three complaints are frequently voiced: The program's industrial objectives are too far in the future; the profusion of subjects of research disperses the financial--and above all, the human--resources of the European teams, a problem that is more acutely felt in the field than at the general management levels; and lastly, the enterprises would prefer agreements between genuinely self-interested partners, which is in direct contradiction with the program's objective of systematizing the inclusion of each and every member of the Community in the joint pursuit of each and every subject of activity covered by the program, while excluding participation by third countries, such as Switzerland or Sweden, for example.

Thus, the principle that guided the conception of Eureka will be welcomed by many industrialists. "Provided, however,"--as put by Mr Pierre Chavance, adviser to the president of CGE [General Electric Company] and president of CESTA [Center for the Study of Advanced Technologies and Systems]--that the project, drawn up, of course, in liaison with the enterprises, does not on this basis prejudge positions the latter could take in the final phase or

concrete agreements that could be signed between groups of countries, based on relations already in being and on market projections." Joint ventures could thus be launched with only two or three partners, if necessary, to obtain results leading as close as possible to industrialization: Prototypes and preliminary pilots.

Electronics, informatics, lasers, intervention robots: A quick run-through of Eureka's initial subjects of research, and "Star Wars" does not seem all that distant to the industrialists. And with very good reason. Still fresh in their memories is General de Gaulle's anger at the American refusal to release the supercomputers needed for the development of the French H bomb: Technology always rhymes with autonomy of decision.

Moreover, from a marketing standpoint, the French armaments industry's "lobby" is already worried about the advantages that fallouts from the SDI will confer on their American competitors. The United States will be achieving major advances which, in 10 years, will threaten European positions in the international markets for conventional arms. Through their military and space programs, the Americans have already achieved some notable breakthroughs in the domain of power lasers, sources and storage of energy, high-temperature materials, infrared sensors, etc. These are all subjects of activity covered by the SDI. What is going to be their impact in the civil domain? More generally speaking, it should be noted that the Federal Government's expenditures on research and development are accelerating their growth. The contribution of military funding to the financing of American university research, which had dropped to 7 percent following the Vietnam War, has risen to 12 percent and will exceed, next year for the third consecutive time, the volume of civil subsidies provided by the NSF [National Science Foundation].

All of this strengthens the case of the big European industrialists. They invoke the example of the mother country of economic liberalism to demand of the different governmental authorities larger-scale funding of development in certain domains, and that of supercomputers in particular, in which 10 years of talks among European firms have led to no real spontaneous joint undertakings. The statements being issued by Matra, Thomson, Siemens, Norsk Data, Philips, GEC, etc, which have proliferated since the announcement of Eureka, must be interpreted more as calls for government funding than as independent commitments to concrete actions.

Significantly, the enterprises that have reacted publicly are all engaged in electronics and information processing--two domains that account for the lion's share of the project proposed by France and that link up with five major sectors: Information processing and electronics; the manufacturing plant of the future and robotics; communications; biotechnologies; and materials, the latter two appearing to be somewhat as yet unsold.

For the first sector, baptized EUROMATIQUE (see boxed insert at end of article), the goal is to furnish the components, machines and softwares needed by the two major information processing axes of advance: Ultra-rapid numerical computation and artificial intelligence.

From basic research to applied research, from oil prospection to weather forecasting, from the design calculations for civil or military planes to those for nuclear weapons, the volume of data to be processed is growing constantly, attaining tens of billions of mathematical operations per problem to be solved. Thus, the calculation of the air flow around an aeronautical fuselage requires 10,000 billion operations. The most powerful supercomputers--the American Cray XMP, for example--take several hours to complete them. The realization of the supercomputer envisioned under Eureka would reduce this processing time to a few minutes, thus approaching the quasi instantaneousness of the "real-time" results furnished by computers in conventional operating modes.

To attain these speeds, one can no longer be content to process operations one after the other using sequential-type computers. Instead, it is necessary to put a very large number of processors, which are the basic units of computers, to work simultaneously. This is what is called parallel architectures. The principal existing supercomputers are American and Japanese ones. In Europe, they are still in the research stage. The French national program MARISIS, launched at the beginning of 1983, should yield, next year, two prototypes with power comparable to that of the machines being marketed today. But the Americans and Japanese are already announcing performance objectives 50 times faster within 2 years from now: Between 4 and 10 gigaflops (the gigaflop is the equivalent of 1 billion operations per second). Very ambitiously, Eureka has set for itself a goal of 30 gigaflops, which will necessitate, of course, the pooling of European resources. These represent real needs. In France, the CISI [International Information Processing Services Company], the information processing subsidiary of the AEC [Atomic Energy Commission], affirms its readiness to equip itself with the most powerful computers available.

The other highly promising axis of research is AI [artificial intelligence]. All problems cannot be solved by ultra-fast computers, which only crunch numbers. Most decisions, personal as well as business, are in fact arrived at through heuristic procedures, the term "heuristic" being derived from the Greek word Eureka: I have found it! Our choices are guided in relation to knowledge, generally empirical, which cannot be reduced to numbers or to mathematical models. The goal of the so-called fifth-generation computers is to be able to manipulate no longer numerical data but rather knowledge and symbols, and derive deductions from them amounting to true reasoning.

Expert systems are one of the essential applications of AI. These systems integrate the pieces of knowledge acquired by the human experts in a specific domain and apply to them certain rules of deduction. They can thus make medical or technical diagnoses, for example, such as the identification of malfunctions. There are now already more than 200 expert systems throughout the world, but most of them are still experimental and limited to aiding the decision process, the human operator still being necessary to implement the latter. This is a stage that should be gotten past under the

project "Management and Surveillance of Large-Scale Industrial Processes" proposed in Eureka. The firm FRAMENTEC, together with Krupp and a British partner, is already developing a project that aims to integrate expert systems directly into the heart of production control and command systems. It is now a matter of going from the simulation stage to the implementation stage. The British industrialists, under the Alvey program, have already set a project in motion in this regard, that is to culminate in an initial test at ICI, the number one in chemicals on the other side of the Channel.

Much more modest applications are also being contemplated, such as aid to the financial decision process, and to the identification of parasitic diseases in tomatoes, for example. These will require only simple microcomputers, since expert systems are not machines but rather softwares, or in other words, programs. They can be run on conventional computers, but their full potentialities cannot be realized except on computers specially designed to process symbols and knowledge. With this in mind, the Japanese launched a vast program in 1982 which is to culminate in a so-called "fifth-generation" pre-industrial computer by 1988. The Japanese objectives, initially viewed with a great deal of skepticism in the West, are on the verge of being attained, outpacing even the efforts of several American civil and military programs. In this domain, the unit of measurement is no longer the instruction, or arithmetical operation, but the inference, or logical operation. It is the equivalent of 100 or 1,000 instructions in information processing work. The Japanese want to attain 100 million inferences per second. The French are proposing an objective 10 times higher, while present American commercial hardware can handle no more than 100,000 inferences per second.

For the time being, the specialized machines in these domains, capable of using "symbolic" information processing languages such as LISP or PROLOG--the latter being of French origin--are being built mainly in the United States. In France, the prototypes of the MAIA machine, developed jointly by the CNET [National Center for Telecommunications Studies] and CGE, will be available within a few months. The European lag in this sector is considerable, since the Japanese and Americans--NCC, Texas Instruments, in particular, with military funding--are ready to build machines of this type whose "core" will no longer consist of conventional IC's [integrated circuit(s)], but that are specially designed to process knowledge. Very few researchers are working on this subject in France.

The American and Japanese projects are being centered on the relations between human beings and their automated facilities, since the commercial development of information processing is highly dependent on simplification of computer interrogation procedures. Computers must become accessible by non-experts in information processing. Likewise, a system permitting interrogation of its data bases in natural language, and no longer requiring a long and constraining ritual, would be a decisive step towards the exploitation of these resources by a large consumer public. Eureka sets

for itself the goal of developing such a system, wherein the data would not be limited to text alone but would include graphics, images and the spoken word. And--European diversity requires it--interrogation could be in any language whatever, constituting a powerful factor in the acceleration of international cooperation.

Custom Software and Circuits Engineering

All these AI developments require the development of new application software, of information-processing tools, a field that is heavily dominated by the Americans. Mr Jean-Claude Rault of the ADI [Information Processing Agency] has calculated that more than 70 percent of the specialized enterprises are located on the other side of the Atlantic, with French firms in third place with 10 percent of the total, just behind the British and ahead of Canada, Italy, Japan and FRG [Federal Republic of Germany].

The French working document proposes a European effort in software engineering as a whole, thus going beyond the heading of AI. It is traditional to emphasize France's respectable position in this domain. The abundance of creativity necessary to consolidate this position can find the support it needs in the resources of a few laboratories and of several small-sized specialized firms, whose dynamism with respect to software appears more to be relied on than that of the big groups. In this domain, as in many others, the success of Eureka will depend also on the capacity for mobilizing the gray matter of the PME's [Small- and Medium-Sized Enterprises].

Machines, architectures, softwares... . Lacking still are components and peripheral memories. It is not surprising, therefore, to find, in the French proposals, a project for a top-of-the-line microprocessor, a circuit integrating 1 million transistors. This portion, which is even less detailed in its formulation, seeks to go after what is now a de facto American monopoly. The customized-circuits design center project, on the other hand, is more detailed. As opposed to the standard, all-purpose "Europrocessor," the customized circuit is the "tailor-made" of the IC's. Designed and optimized for a specific application, it is more reliable, more efficient and more compact. Its design takes several months and its fabrication cost is high. The market penetration rate of these special-purpose circuits is very high: 1 percent of the IC world market in 1974, 20 percent today, and 30 percent within the next 10 years. A disturbing sign is that European users represent a declining fraction of this market, which translates their lag in the "electronization" of things.

Computers also use IC memories, containing in permanent storage form the program that dictates its the microprocessor's manner of operation and the data on which it operates momentarily. Eureka would aim for a "live" (erasable and reprogrammable) memory with a capacity of 64 million bits or units of information. Currently available memories did not go beyond 256,000 bits until the announcement made only a few weeks ago by Hitachi and Texas Instruments, offering 1-million-bit (1-Mbit) memories. On the European side, Siemens and Philips have just signed an agreement to also

manufacture 1-Mbit memories and to work together towards 4 megabits. Thomson, which depends on LETI [Electronics and Information Processing Technology Laboratory] of the CENG [Grenoble Nuclear Research Center], has just joined them with the British GEC [General Electric Company] Group.

The EUROMATIQUE series of projects thus has a high degree of coherence, since it provides for the components and softwares necessary for the construction and operation of microcomputers, of conventional computers and of those needed by AI and supercomputers. Inversely, these different machines will be aiding in the design and production management of components and even, one day, softwares. The advances made in each domain interact with each other.

Third-Generation Robots

These tools are also indispensable to the projects grouped under the heading EUROBOT, the basic aim of which is the development of third-generation robots. These would be mobile, autonomous devices equipped with sensors enabling them to interact with the environment. The first generation of robots is that of industrial equipment, programmable machines controlled by an information processing system and designed to perform various tasks: Materials handling, welding, painting. There are some 2,800 robots of this type in France and some 20,000 in Europe, Germany leading the other countries in this respect with half this total. The second generation of robots incorporates vision sensors for the recognition of parts, essentially for assembly purposes. These machines number less than some 100 in France.

Today, EUROBOT seeks to speed up the development of mobile devices designed to assist humans in the performance of dangerous or difficult tasks. This interpositional robotics is not new. During the 1960's it was one of the first pieces of research undertaken by the Stanford Research Institute, involving experimentation with the mobile robot Shakey. In France, the ARA [Advanced Automation and Robotics] research program was limited for 10 years to a meting out of thinly allocated credits, controlled by the CNRS [National Center for Scientific Research] and divided among 45 research "teams" consisting of 150 scientists in all. Its concrete results have yet to be seen: The Toulouse LAAS's [Systems Automation and Analysis Laboratory('s)] mobile robot Hilare is but a 1980 version of the American Shakey, which was abandoned in 1973. As for the ARA projects to develop flexible workshops[1] for assembly, involving two industrial enterprises--Renault and Telemecanique--they have not yet yielded concrete realizations. They have been brought to a halt by the dispersion of resources and facilities and by the difficulties of transferring the products of research to industry.

Results have been more encouraging in other European countries. In Great Britain, for example, the University of Cranfield, and in Germany that of

Aix-la-Chapelle, have become application research centers working with the industrialists in the domain of flexible workshops, robots and automated machine tools. In Italy, research is focusing on the technology of laser machining.

By bringing together the scattered teams, by pooling the gains being made by each country, so as to better incorporate them into industrial projects, the EUROBOT project should enable the overcoming of the difficulties of developing European third-generation robots.

An analogy will be evident between the EUROBOT project and the RAM [multipurpose self-propelling robots] program, which was launched in April 1984 by CESTA. RAM is the "advanced robotics" component of the TCE [Technology, Growth, Employment] program [see article "EUREKA OFFICIAL ON HOPES, AIMS FOR PROGRAM" in this book]. From the outset, the launching of RAM was handicapped by funding problems and by problems owing to international implications. The Regie Renault and COMEX [Maritime Appraisal Company], approached on heading the two--domestic and underwater--robot programs, have just declined. All that remain at this time are a nuclear robotics project, which is indispensable to the AEC [Atomic Energy Commission] and is funded by it; an agricultural robotics subproject RAMAGRI comprising two facets, namely, a fruit-picking robot and a forestry undergrowth-clearing robot; and a cleanup robot for the Paris buses of the RATP [Independent Parisian Transport System]. In 1985, 20 million francs were committed, amounting to only half the planned funding.

Perhaps EUROBOT will permit realigning RAM on several objectives: A robot for agriculture, in which CEMAGREF [National Center for Mechanization of Agriculture, Rural Engineering, Water and Forestry] would be an active participant; an interpositional robot for dangerous environments, to fill civil safety needs such as firefighting, natural catastrophes, pollution, etc. Under EUREKA, some industrial firms have already submitted proposals. Among these are Hispano-Suiza, which has the benefit of experience with its ISIS robot for the maintenance of nuclear power plants, Technicatome, CSEE [Signals and Electrical Enterprises Company], and some innovative PME's [Small- and Medium-Sized Business(es)] such as AID [expansion unknown] at Grenoble, which is already engaged in educational robotics. The military, through the Defense Ministry's DRET [Directorate for Research, Studies and Techniques], are also interested. This past May, a seminar was held at Toulouse on battlefield interpositional robots, especially for mine-clearing and decontamination operations.

Are the EUROBOT choices justified? It is by no means certain that the French industrialists will wax enthusiastic over this third-generation robotics. Their concerns lie elsewhere and are short-term ones: The four CIM [computer-integrated manufacturing] "engines" put in place by the government last year under the "programme productique" [CIM Program](2) have not yet fulfilled the role as prime movers that was expected of these big enterprise groups. Renault is questioning its interest, if any, in

"atomization" of its Renault Automation branch; Matra has just sold its subsidiary Robotronics to the American firm Allen Bradley and is going to form a joint company with the Swedish ASEA so as to settle the question of Sormel, its other assembly-robotics subsidiary installed at Besancon. CGE is not very satisfied with the initial results of the Compagnie Generale de Productique [General CIM Company], formed a year ago, as was the SGN Engineering Company with its grouping of six enterprises under the banner of "Productivity Plus." In the robotics industry, following the optimistic views that have been expressed these last few years, the pervading feeling borders on the morose... .

The second major aspect of the EUROBOT program consists of building an automated and flexible workshop, requiring the integration of present-day CAD/CAM techniques, combining automated machine tools, robots and materials-handling systems, into a manufacturing or assembly workshop controlled by an information-processing system. In this domain the French builders and design engineers are, theoretically, at least, in a good position: Two big machining flexible workshops have been put into service by RVI [Renault Industrial Vehicles], at Boutheon, and by Citroen Mechanical Constructions, at Meudon. These two pilot installations, which were to serve French industry and their promoters--Renault Automation, SODETEG-TAI for RVI, and Automatique Industriel for Citroen--as showcases, have produced only very limited fallouts to date. No other big workshop of this type has yet been installed. The industrialists have settled for less futuristic plants of the future! SODETEG-TAI has installed a mechanical welding workshop for Poclain-Potain and a surface treatment workshop for Aerospatiale at Toulouse.

The main obstacle to the installing of highly-automated CIM plants is the necessary mastery of the simulation software for dealing with flow analyses and scheduling problems in real time. Expert systems for production will be developed in due time to facilitate the scheduling and management of the machines, quality control and automatic maintenance troubleshooting. In France, a few teams are working on this question, particularly at CGE which, in its laboratories at Marcoussis, is testing its expert scheduling system SOJA, for Alsthom-Atlantique's pilot sheet-metal workshop. The British and the Norwegians are also at work on the problem.

The last of the four major components of EUROBOT is the power laser, unquestionably an industrial tool that is being incorporated today into machine tools designed for cutting and heat treatment. In France, CETIM [Mechanical Industries Technical Center] figures show some 100 laser machines in service in mechanical industry enterprises. In due time, the trend points to laser-type flexible workshops, as the Japanese are proposing. At Tsukuba, the plant of the future is a 20-kW, CO_2-type, laser generating unit that distributes the beam to the different machines. The principal builders of power lasers are Americans. Powers, generally speaking, range up to 5 kW. The Japanese have picked up and improved the technology developed by AVCO in the United States, some 10 years ago, for NASA, and have attained powers of 15 to 25 kW. In France, CILAS [Industrial Laser Company] offers lasers

of 3 to 4 kW, and Ferranti (United Kingdom) offers up to 3 kW, as do also Rofin Sinar (FRG) and CLB [Belgian Laser Company] (Belgium). EUROBOT seeks to bring about a collaboration among these builders for the development of a 50-kW research laser and of a standardized industrial source.

In sum, the integrated workshop of tomorrow will not exist until all these links in the information processing chain are interconnected by a network. The general problems of communications networks comprise one of the pivotal axes of Eureka [EUROCOM], which proposes, to begin with, the installation of an information processing interconnection system linking all the European researchers. IBM is known to be already installing a network of this type, EARN, linking 50 European universities equipped with its hardware. The DGT [General Telecommunications Directorate], for its part, has just launched the first phase of the installation of its RNIS [ISDN [Integrated Services Digital Network]]. Its capacity (100,000 lines) and its transmission rate (up to 144 kbits/sec) will provide access to a "palette" of telematics services. In due time, this will be a broadband digital network capable of transmitting video communications linking interactive terminals. Optic-fiber cable networks will find in it a very vast field of application.

From a reading of the document submitted by France, it appears that the preparation of the projects in biotechnologies (EUROBIO) and materials (EUROMAT) was not as extensive as that of the other subjects. Nevertheless, the priorities set by EUROBIO concern two key domains from the standpoints of both marketing and human impact, namely: Agriculture and food farming; and health care.

The project on creation of new plant seeds through genetic engineering is aimed at producing species promising higher yields and higher resistance to diseases, to pests, to chemical products and to hostile climates. These are long-term objectives for which a timetable is hard to establish. As for materials, their presence already is implied in EUROMATIQUE, which addresses methods for the putting to use of silicon and, for very fast circuits, gallium arsenide. And in EUROBOT, the performance ratings envisioned will obviously necessitate a lightening of their articulated structures through the use of composite materials. The use of optic fibers is also implicit in EUROCOM.

The specific EUROMAT project mentions as an end-use objective only the development of a terrestrial 500- to 1,000-hp heat-engine turbine using ceramics for heat exchangers and other components. In reality, this is a project in which materials are but one aspect of the innovations it seeks. It is being urged because of the importance of new ceramics, particularly for enhancing the performance ratings of Diesel engines and turbines. The Americans, and especially the Japanese, are giving priority to programs in this regard. The British, who pioneered in this field, then abandoned it, have resumed work in it. The Germans have for several years been pursuing a specific program on turbines.

Many other subjects could be brought in under the materials domain, and some of them are sitting in desk drawers. To cite just one of them: The lightening of vehicles is a future necessity. The development of advanced composites that can be produced at low cost and high output rates would be a very reasonable objective. In this sector, however, as in the others, Eureka cannot be reproached with not having encompassed all the key sectors: Its intent was not to present a paper on technology, but rather to identify those of the important problems that can be made the object of concrete joint undertakings among several European partners.

A Creational Society

Will all of this suffice to ensure European technological success? The principle itself of these projects calls for the creation of standards as regards electronic components, software development tools, languages. This is an essential aspect. For example, despite the French parentage of the AI language PROLOG, there exist, in France itself and throughout the world, so many incompatible varieties of PROLOG that the programs written using this language find limited marketability. This raises the risk of ending up with an imposed American de facto norm...

It is also reasonable to assume that the setting in motion of actions such as those envisioned in Eureka is not in itself sufficient to automatically harvest the famous industrial fallouts that are always referred to in connection with major undertakings and that are rarely totted up in the concrete terms of a balance sheet... Why not organize these fallouts by providing, for each project, a head of applicative development, with his own budget and responsibility for compiling all the good ideas, all the germs of innovation, and disseminating them throughout the European industrial fabric? After all, Europe's lag behind Japan is owing, first and foremost, to its slowness in applying new ideas and techniques, in accepting change. The problem is, first and foremost, cultural.

Cultural also are the reasons for European slowness to adopt modern methods of organizing creativity and work: Mastery of quality, value analysis, design, non-Taylorist organization. Without the adoption of methods such as these, the introduction of modern machines or techniques can only lead to failures, as the counter-performances of some big flexible workshops have proven.

A Eureka program that incorporates technique alone, in its strict sense, without its methodological, organizational and human environment, cannot possibly help Europe to succeed in this vast technico-social transformation in which we are involved--the "intelligence revolution." This transformation will not consist, as is often being said it will, of the advent of a communication society, but of that of a creational society. Competitiveness will now be demanding the mobilization of the intelligence and dynamism of each of us, as much as it does that of our capital resources and machines.

[Boxed insert p 18]: Eighteen Programs

The summit meetings of the industrialized countries, the most recent of which was held in Bonn in May of this year, the next one being scheduled for 1986 in Tokyo, include Canada, the United States, France, Italy, Japan, FRG, United Kingdom, and the Commission of the European Communities.

Each of the TCE Working Group's programs is headed by one or more of these countries and/or the Commission, as follows [countries listed in French alphabetical order]:

I. Stimulation of Growth Conditions for Improved Management of Energy.

1. Photovoltaic solar energy (Italy, Japan).
2. Controlled thermonuclear fusion (European Communities, United States).
3. Photosynthesis (Japan).
4. Fast-neutron reactors (United States, France).

II. Improved Management of Food Resources.

5. Food technology (France, United Kingdom).
6. Aquiculture (Canada).

III. Improvement of Living and Job Conditions and Environmental Protection.

7. Space-based remote sensing (United States).
8. High-speed trains (France, FRG).
9. Habitat and urbanism for developing countries (France).
10. Advanced robotics (France, Japan).
11. Impact of new technologies on traditional industries (France, Italy).
12. Biotechnology (France, United Kingdom).
13. Advanced materials and norms (United States, United Kingdom).
14. Education, occupational training and culture, using new technologies (Canada, France).

IV. General Advances in Basic Research.

16. Biology (European Communities).

17. High-energy physics (United States).

18. Exploration of solar system (United States).

[Boxed insert p 19]: The 24 French Proposals

EUROMATIQUE

Supercomputers, parallel architectures, AI and expert systems, fast silicon, gallium arsenide:

--Vectorial supercomputer;

--Massively parallelled information processing architectures;

--Synchronous-architecture-multiprocessor machine;

--Mass memory;

--Software engineering center;

--Dedicated circuits and line of symbolic machines;

--Generalized applications-design-and-realization tools for expert systems;

--Multilingual information processing system;

--Management and surveillance of large-scale industrial processes;

--Europrocessor;

--64-Mbit memory;

--European plant for production of gallium arsenide circuits;

--European customized-circuits plant.

EUROBOT

Third-generation robotics, automated plant, CAD/CAM, lasers:

--Civil safety robots;

--Agricultural robots;

--Automated plant (CAD/CAM);

--CO_2, CO, excimer and free-electron lasers.

EUROCOM

Research networks, equipment for broadband networks:

--Information processing networks for research;

--European large-scale digital switcher;

--Wideband networked office automation and information processing;

--Wideband transmission.

EUROBIO

--Artificial seeds;

--Control and regulating systems.

EUROMAT

--Industrial turbine of advanced design.

FOOTNOTES

1. Workshops capable of producing different pieces without changes.

2. A 3-year program adopted by the Government on 5 October 1983 to modernize manufacturing industries and develop a French CIM hardware industry, and to promote training and research.

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CSO: 3698/663

SCIENTIFIC AND INDUSTRIAL POLICY

FRENCH CIVIL RESEARCH BUDGET 1986-1989 INCREASES

Paris AFP SCIENCES in French 19 Sep 85 pp 1-2

[Article: "Over FF 42 Billion for Research in 1986"]

[Text] Paris--Once again, the Civil Research Budget is given a fair share of the overall 1986 State Budget, as provided for in the bill "Three-Year Research Plan" for the period 1986-1989, that was passed at the first reading by the National Assembly before summer, and as Mr Hubert Curien hoped and had been assured it would during its preparation: FF 42,083.9 million compared with FF 38,888 million last year.

According to information provided after the Cabinet meeting of 18 September, the civil research budget will increase by at least 4 percent per year during the next 3 years, increasing even by 8.2 percent by value already in 1986 as far as program authorizations and current expenditures are concerned.

If we take into account the tax credits granted to businesses that will increase the proportion of their revenues devoted to research--credit ceiling increased from FF 3 to FF 5 million--the civil budget will even increase by 9.8 percent by value. Equipment spending alone will increase by 15 percent by value next year.

These figures do indeed confirm the government's determination to continue and intensify the country's modernization by means of scientific and technological progress, and to ensure that France ranks foremost among leading nations as far as science and technology are concerned, officials pointed out Rue de Rivoli.

Thanks to this budget, 1,400 jobs--including 710 researcher and research engineer jobs--will be created next year, and many promotions will be available to research project leaders (200) and to engineers, technicians and administrative personnel (400).

Including tax benefits in the form of tax credits, FF 12,857 million will be allocated in the research budget to businesses that will innovate, and these will also benefit from the credits allocated for large technological development projects, e.g. through contributions made to the CNES [National Center for Space Studies] budget (FF 4.21 billion) or to the electronic sector (FF 2.35 billion for computerization).

There will remain to finance the projects of the "Eureka" program for the Europe of technology, for which the government announced that it intended to allocate FF 1 billion.

Mr Hubert Curien was to disclose details of his ministry's budget on 20 September, at a press conference.

Civil Research Budget (in Millions of French francs)

	Initial Finance Law 1985	Next Finance Law 1986
I. Current expenditures	18,443.5	19,964.9
incl. 1. General budget	18,259.7	19,764.9
2. Appended budget of the Post and Telecommunications Administration	183.8	200
II. Equipment spending		
- Program authorizations	20,444.9	22,119
incl. 1. General budget	13,611.1	14,214
2. Appended budget of the Post and Telecommunications Administration	6,806.9	7,875
- Payment credits	18,284.8	21.028
incl. 1. General budget	12,192.2	13.281
2. Appended budget of the Post and Telecommunications Administration	6,071.6	7.724
III. Tax credits - research	400	1,040
Total: program authorizations + current expenditures + tax credits	39,288.5	43,123.9

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CSO: 3698/4

SCIENTIFIC AND INDUSTRIAL POLICY

BRIEFS

FRENCH FIRMS INTERESTED IN EUREKA--At a conference on 10 September, characterized by the Ministry of Research as "very constructive," Mrs Cresson and Mr Curien, respectively the ministers of industry and research, together, met with some 40 French industrialists--notably, Siemens France, Thomson, Crouzet and Cap Sogeti--interested in the European cooperation program Eureka. The purpose of this meeting was mainly to exchange views and information of mutual interest prior to the forthcoming Eureka meeting in Hannover (FRG). The latter meeting, which is to be held in November, is expected to mark the actual operational launching of the program, with the presentation of an initial set of industrial projects. The two ministers emphasized the "essential role" of the industrialists themselves in the definition and conduct of the Eureka projects. For Mr Yves Sillard, the Eureka national coordinator (he is shortly to receive an official letter defining his mission), the 10 September meeting provided him an opportunity for an initial contact with the firms interested in Eureka--firms whose sole interlocutor he will be for the drawing up of their dossiers. [Text] [Paris ELECTRONIQUE ACTUALITES in French 20 Sep 85 p 3] 9399

FRENCH TECHNOLOGY UPDATE LOANS--On 16 September, in Paris, Credit Lyonnais and the National Agency for the Implementation of Research (ANVAR) signed an agreement that will make it easier for businesses to obtain technological participation loans from the Industrial Modernization Fund (FIM). The agreement is designed to intensify the collaboration that already exists between the two institutions, and it will expedite participation loan applications submitted by businesses and simplify the processing of applications involving no special problems, a joint communique indicated. As is known, technological participation loans (PPT) are, together with leasing, one of the two instruments used by the FIM to help businesses complete investment projects designed to improve their technological level. These medium to long-term loans, bearing interest at 9.25 percent, can cover up to 70 percent of a manufacturer's modernization expenditures. Credit Lyonnais, through its network of branches, and ANVAR, through its regional delegations, have agreed to improve the dissemination of information at local level in order to help businesses finance their projects. The two institutions had already signed two agreements under which Credit Lyonnais lends its financial expertise to ANVAR for the attribution of FIM technological participation loans. [Text] [Paris AFP SCIENCES in French 19 Sep 85 p 11] 9294

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